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DEFENSE INDUSTRY BULLETIN

Vol. 3 No. 11 December 1967

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The *Defense Industry Bulletin* is published monthly by the Business & Labor Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication was approved by the Director of the Bureau of the Budget.

The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 1E764, The Pentagon, Washington, D.C. 20301, telephone, (202) OXford 5-2709.

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DEFENSE INDUSTRY
BULLETIN

Published by the
Department of
Defense

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The Selection of Information Processing Systems To Support Air Force Management

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A continuing problem facing the Air Force is the allocation of resources in the acquisition of support systems. The purpose of this article is to present the methodology and thinking that goes into the selection of a typical Air Force resource management data processing system.

Before addressing the specifics of the computer selection process, the overall framework within which such decisions are made must be considered.

In DOD, each of the Military Services plans its requirements in order to meet an objective force for a specified future time period. Under the direction of the Secretary of Defense, these plans for all the Services are grouped into major program packages, such as Strategic Forces, General Purpose Forces, or Research and Development Program. There are nine such program packages which integrate requirements for men, equipment and installations, in order to achieve the greatest effectiveness consistent with the least utilization of resources in accomplishing specified national defense objectives. These are the basic building blocks of the planning process which we call programming budgeting. It has been employed in the Defense Department since 1961.

When Robert S. McNamara became Secretary of Defense, he asked Dr. Charles J. Hitch, then of RAND Corp., to assume the position of Assistant Secretary of Defense (Comptroller), in order to implement the economics of defense concepts about which Dr. Hitch had written extensively. The principal Hitch contributions to DOD were the division of planning into reasonably discrete program packages, aligned to the principal missions or responsibilities of the total Defense Department; a five-year planning period; and the recognition of interchangeability of forces and, hence, of the alternatives or options available to military commanders and resource managers in the accomplishment of particular missions. Dr. Hitch emphasized analytical techniques and the use of cost-benefit or cost-effectiveness criteria in comparisons of forces, individual weapon systems, or support systems. Thus major decisions on the acquisition of these systems and forces, as well as their deployment, are now based on studies designed to optimize mission performance and resource consumption.

It should be emphasized that whenever possible, program elements are measured in physical and financial terms. Each element must fit into the long-range objective force with regard to its input and output. This procedure forces the evaluation of a system based on a cost versus benefit analysis, and the selection of the form of implementation that is most responsive to a cost versus effectiveness analysis. Moreover, the concern is with the full cost to the Air Force of a program's investment and operation over the anticipated life of the particular system.

The critical financial decisions of each program element are based upon the normal costs of development, procurement and operations. Since there are no fixed relationships between these cost categories, investment costs and the cost of operating the proposed force or system each year, as well as the total life cost, must be known before proceeding with production and deployment. Plans are projected eight to 17 years, depending upon the lead times required for research, development and procurement. However, all other program data, physical and financial, are projected five years. This is called the Five Year Defense Program.

Requirements of ADP

This briefly defines the environment in which the cost benefit of a support system, such as improved information processing technology, must be evaluated. With an information processing technology that is rapidly advancing and continually changing, the automatic data processing (ADP) structure has been revised and modified to keep pace. The Air Force's original data automation energies were fragmented and decentralized. Major commands and functional managers developed systems, wrote machine programs, and even selected computers which were dedicated to their exclusive use. As the complexity of Air Force information systems grew, it was evident that a standard approach to the selection process was needed. The many different data systems, then in being, were developing at different rates; moreover, with the advent of the integrated program-budget approach to planning in DOD, the need for compatible data banks and an integrated family of data systems to support general management and top-level command decision making became paramount. So, paradoxically, the Air Force had to introduce standardization, while experiencing rapidly changing data automation technology. Without standardization, all or most of the potential that data systems offer would be lost.

The Air Force has adopted the concept of standardization which improves the interface or "cross-talks" between the different data systems, as well as between and within echelons of command. Data elements and data codes, which are basic to every data system, are also being standardized.

The scope of Air Force data automation is as broad as its nature is complex. Almost all functional information systems are, or will be, automated in the near future. Trying to describe the magnitude of the program in simple terms is exceedingly difficult. For example, the Air Force now has in use approximately 1,000 computers to serve various management applications. Either this number will grow as the management information systems are further defined to meet the needs, or a new, more powerful system to satisfy the forecast demand must be provided.

The benefits to be gained from a new, more powerful system will be realized in the increased efficiency of data processing capabilities, and in increased responsiveness to the various levels of management requirements. The standardization of data processing capability will lead to savings, not only through the increased efficiency in providing information, but also in the areas of training and personnel assignments as well. The concept of modularity provides the ability to handle significant expansion of information processing requirements, without having to acquire new data processing systems for each additional requirement.

For each of the new information systems, a thorough analysis is performed in which the specific requirements are defined, the hardware/software specifications determined, the most cost-effective vendor proposal selected, and the optimal utilization scheme implemented. In effect, this is determined in order to make the computer more responsive to management requirements, rather than management responding to computer requirements. Concentration in the past has been on maximum utilization at the expense of providing timely management information; now the emphasis must be shifted to the needs of the manager. For this reason, the Air Force has made the general decision to move into such areas as real-time management information processing.

There has been little actual Air Force experience with many of these new computer applications. Therefore, an analysis of user requirements poses a formidable problem to determine, on a cost-effective basis, the use of real-time processing, the size of the data base, the type of storage, and the number of remotes to be provided. A cost-effectiveness analysis must be applied to each specific application in order to determine the actual requirements for this new technology in each command management area, and its interrelationship with the other command management areas.

This is an overview of the rationale employed in the selection of Air Force information processing systems. The specific procedures now followed have been developed after disappointing experiences in procuring data processing equipment by relying on technical data brochures and contractor promises of performance. To avoid such experiences, the Air Force now employs a method of selection which in general:

- Defines for the potential vendors the Air Force requirements.
- Allows for a period of clarification of the requirements.
- Demands that the vendors demonstrate, at a pre-determined date, their capability to meet Air Force requirements.
- Evaluates the performance of the various responsive vendors.

To be able to address the source selection process in greater detail, the process will be considered from two points of view: the mechanics of the evaluation, and the necessary criteria to be used in the evaluation.

ADP Selection Process

While operating within the conceptual framework previously considered,

I. DERIVE OPERATIONAL USE HOURS CORRESPONDING TO 24 HR/DAY MANNING.

(OP. USE HRS/MONTH) = (MANNING HRS/DAY) (DAYS IN WORK MONTH) (MANNING FACTOR)

$$= (24)(22)\left(\frac{12}{16}\right) \approx 400$$

II. GROWTH EQUATION

$$x = a(1 + i)^N$$

X = Number of op use hrs/month
i = Growth rate/year
N = Number of years in proposed system life
a = Initial op use limit

Solve for initial op use limit

$$a = \frac{X}{(1 + i)^N} = \frac{400}{(1 + .10)^5} \approx 250$$

Figure 1.

the formal procedure for the Air Force is defined by regulation. The major objectives of the Air Force's data processing program are:

- To increase the effectiveness of data processing capabilities and responsiveness to management requirements.
- To provide additional standardization and an integrated data processing capability to meet functional requirements, and cross-functional, general management, or command needs.
- To provide for evolutionary expansion of data systems and acceptance of new system requirements without the necessity of conversion to new electronic data processing equipment (EDPE). It should be noted that modularity does not preclude the acquisition of new EDPE when a new equipment-software system is more cost effective.
- To provide for the most economical and efficient method of satisfying approved functional management data systems requirements.

This one-step process assists the Air Force in selecting the best computer equipment in the period of time necessary to satisfy the requirements placed on the computer system. By precisely defining the user requirements and thoroughly evaluating and testing the vendor's proposals, the Air Force is able to make a selection without entering into a time-consuming, multiple-step selection process.

In order to implement these concepts, selection standards must be developed for inclusion in a Request for Proposal (RFP). These mandatory program requirements are measures which evaluate the performance of equipment submitted by vendors to accommodate requirements determined prior to the cost-benefit study.

Evaluation of Proposals

A selection plan, which incorporates the necessary evaluation criteria determined from the requirements study, is prepared and approved. Working groups, operating independently of each other, are established to evaluate each of the major criteria in accordance with the selection plan. Although the groups function independently, there is a necessary interlocking of the effects of the criteria. For example, what may appear to be a systems performance criterion is, in fact, also a cost criterion. The evaluation focuses on four basic criteria:

- Systems performance, including a live test (benchmark), to demonstrate the capability of the equipment and associated software to perform representative problems of the systems to be implemented.
- Technical characteristics, *e.g.*, reliability, interchangeability and expansibility.
- Vendor support, such as free test time, quality of documentation, and training.
- Estimated cost to the Air Force, including maintenance, one-time costs to become operational, and direct operating costs extended through the anticipated life cycle of the system.

To insure objectivity, teams of the Air Force's most qualified technical experts constitute the various working groups which evaluate vendors' performances relative to these criteria. Examples of their evaluation tools are systems simulation and measurement, and live benchmark tests.

One team has as its task the analysis of systems performance. Its function is to review and validate the timings submitted in the vendors' proposals. In addition, the team performs timing functions as members of the Live Test or Benchmark Demonstration Team. During this test demonstration, the vendor must run certain programs which have been provided by the Air Force, and which represent specific tasks to be performed by the data system.

From a knowledge of the proportion of the total workload represented by each task, the team can extrapolate to get a measure of total workload performance.

Another independent group is the Software Group. Determination is made of the responsiveness of vendors' proposed software to mandatory requirements by comparative measurement of performance through extensive analysis and live test. The next group validates the vendors' compliance with mandatory requirements, and evaluates the technical characteristics of the equipment proposed.

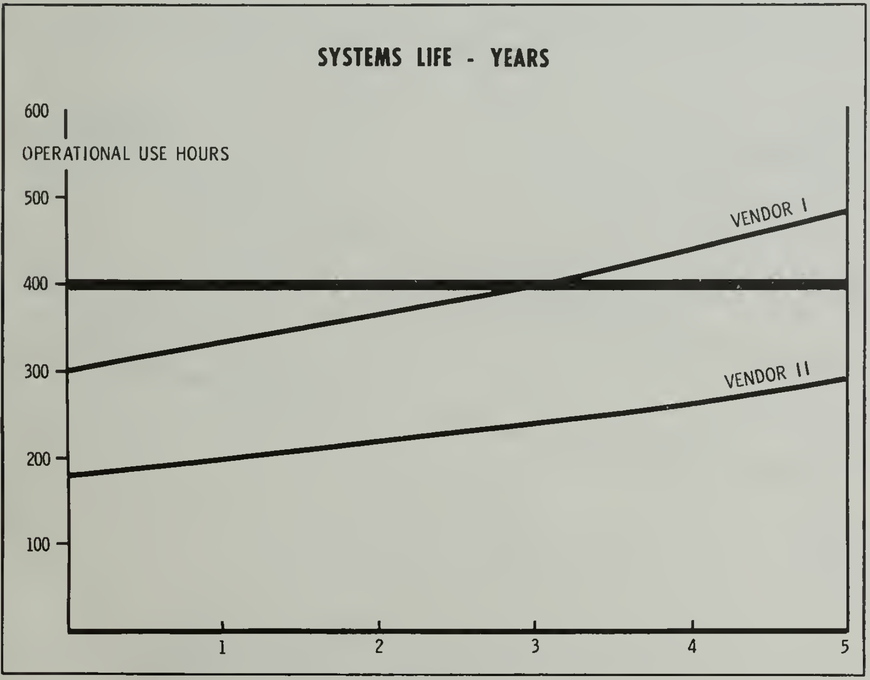

Figure 2.

A fourth group is the Vendor Support Group which validates the program test time, the completeness of manuals and documentation, and necessary maintenance support. The fifth and last group is the Cost Group. This group reviews the cost proposals to insure completeness of the RFP, validates the cost compilations submitted by the vendors, and develops a detailed cost analysis.

A cost-effectiveness comparison is made on the systems which are proposed by the responsive vendors. Further refinement in the comparison of successful vendors can be accomplished by using methods to maximize the effectiveness of the proposed equipment under the constraints of the RFP. This is done since our management system requirements are increasing exponentially, and it is imperative that the highest possible degree of flexibility and performance be maintained. Various techniques from the field of operations research are useful in determining the flexibility and capability of these systems. Each of these stages in the selection process addresses the planning or requirements part of the programming and budgeting cycle mentioned earlier.

The combined technical findings of the working groups are then presented to a Source Selection Advisory Council, consisting of general officers, senior colonels and civilians. The council, after weighing the technical findings, arrives at a source recommendation which must be concurred in by the Chief of Staff before being submitted to the final source selection authority for approval. The review panels are not aware of the identification of the specific vendors while they are evaluating the benchmark test data or the technical specifications of the proposed systems.

Mandatory Requirements

In order that the hardware and software capabilities meet the major requirements of the management information systems, the mandatory requirements are included in the RFP. Examples of these are:

- Necessary software requirements.
- Training of personnel, programmer support and follow-on maintenance.
- All system components proposed, including expansion requirements, must have been formally announced for market purposes, and the live test demonstration must be performed successfully.
- An hourly operational use time limit, where operational use time is defined as the number of hours per month that the machine must be in operation to accommodate the defined workload. This criterion puts an upper bound on the time a vendor's system may take to process the initially defined workload in the RFP.

Hypothetical RFP

What are the implications inherent in imposing a mandatory requirement on operational use hours per month?

Consider a hypothetical RFP. The operational use hours criterion would be derived from several factors. First, the workload growth rate in the RFP will be based on a 10 percent rate that has been derived from past experience with batch processing, and will be used across the board for both batch and real-time processing. It has been determined from experience that it takes two shifts—16 hours—per day to support an operational use time of 12 hours per day. In addition to these two factors, it is required that there be no necessity for systems expansion over the estimated five-year life, or conversely, that the manning hours remain under 24 hours per day throughout the life of the system. Within these constraints, it is possible to derive a 250-hour limit on the operational use time initially required to support the anticipated workload. (See Figure 1.)

To illustrate the application of the 250-hour criterion, two vendors replied to the hypothetical RFP. Vendor I exceeded the 250-hour limit, while bidding a $35 million system. Vendor II, on the other hand, performed substantially below the 250-hour ceiling and bid a $45 million system. In order to compare the two vendors cost effectively over the five-year system life, one aspect that must be considered is the effect the growth rate will have on each vendor's system.

Initially, a 10 percent growth rate was considered for both batch and real-time processing to investigate the effects of system's growth. Consider

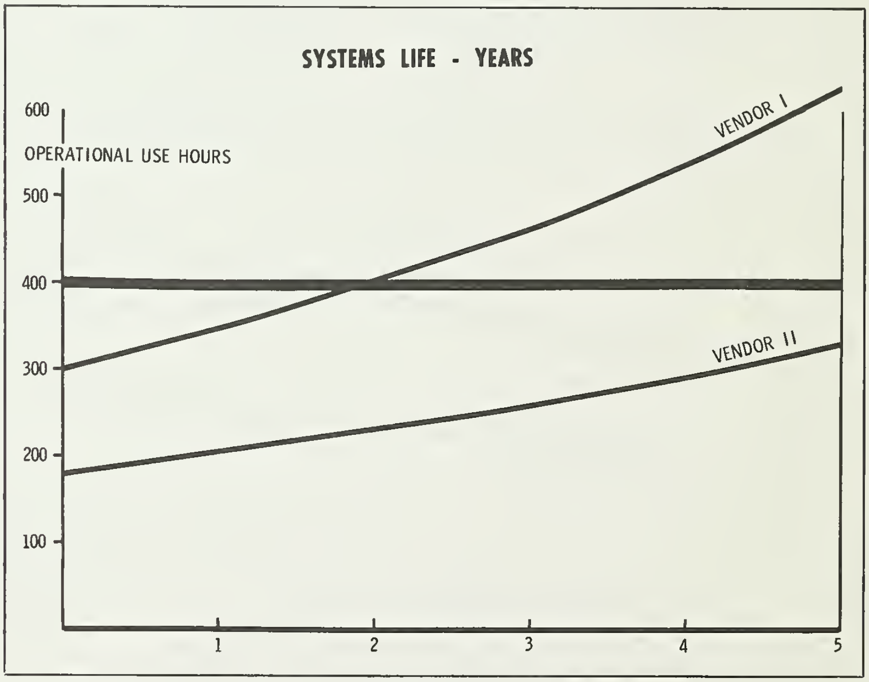

Figure 3.

Vendor I (Figure 2), who starts at 300 hours, a position 50 hours above the 250-hour base line. By the third year, he has broken through the 400-hour ceiling—implying that the system is manned 24 hours a day and any further expansion of workload requires new equipment. By the end of the system's life in the fifth year, it can be seen that Vendor I requires 480 hours per month to process the workload, a manning factor of 29 hours a day.

Vendor II, however, has bid a more expensive, but more powerful system which starts at a point 70 hours below the 250-hour base line and never does break through the 400-hour ceiling. In addition, he is able to process the workload in 60 percent of the processing time required by Vendor I. Vendor II is 40 percent more effective than Vendor I.

Parametric Analysis

Since there has been little actual experience in the Air Force with real-time systems, a very conservative growth rate of 10 percent was assumed. It should be realized that real-time growth rate is an area of uncertainty and concern and, therefore, deserves further analysis. The ability of each of the vendors to meet future requirements placed on the computer system by the addition of new, real-time systems must be determined. In order to do this, a parametric model is used in which the growth of both real-time and batch processing can be varied. By increasing both areas at different rates, a more precise idea can be obtained of the flexibility of each vendor's system.

For example, on one trial the historical 10 percent growth rate was assumed for batch processing, while a 20 percent growth rate for real-time processing was used (Figure 3). In this case, Vendor I breaks through the 400-hour ceiling in two years, requiring equipment acquisition at that time. By the end of the fifth year, 625 operational use hours per month, with an associated 39-hour manning factor, are required to process the workload.

Vendor II, however, is never in trouble even at the increased rate of growth for real-time systems, requiring at the end of the fifth year 332 operational use hours per month with a manning factor of 20 hours per day. Vendor II can now accomplish the job in 50 percent of the time required by Vendor I.

To return to the 10 percent growth rate used in developing the hypothetical RFP, the cost factors implicit in the total system's life must now be considered (Figure 4). The bidding prices for the two systems, which include maintenance up to the 250 operational use hours, were $35 and $45 million for Vendors I and II, respectively. Additional costs due to operations and maintenance above the 250 hours amount to $1 million for Vendor I, and $.1 million for Vendor II. These costs for the hypothetical system were based on an assumed factor of $.1 million per additional 100 hours of manning. Acquisition of equipment to handle a workload over 400 operational use hours would require an estimated additional $8.6 million. There would be an estimated $.5 million cost for installation. Therefore, at the end of the five-year system's life, we have Vendor I with a total system's cost of $45.1 million, and Vendor II with a total cost of $45.1 million.

At the end of system's life the total costs are at equal levels under the assumed 10 percent growth rate. Previous analysis showed that Vendor II is at least 40 percent more efficient.

The 250-hour limit criterion then is one important measure which enables the Air Force to acquire cost-effective systems. However, it is not only a measure of overall system effectiveness, it can also be used as an input to further analysis.

	VENDOR I	VENDOR II
BID	35	45
ADDITIONAL OPERATION AND MAINTENANCE	1.0	.1
EQUIPMENT ACQUISITION	8.6	--
INSTALLATION	.5	--
TOTAL SYSTEMS COST	45.1	45.1

COSTS IN MILLIONS OF DOLLARS

Figure 4.

Cost Benefit of Satelliting

One possible approach in this type of analysis is to consider extending the remote capability of our equipment to permit satelliting. Satelliting consists of placing a large central processing unit at a centrally located Air Force installation, and processing the workload of various smaller installations on the centrally located processing unit through the use of telephone lines and remote peripheral equipment.

If one base is satellited on another, the cost of the central processing unit on the satellited base is avoided, but there are incurred costs of communication lines between the host and satellite, and of special peripheral equipment required at the satellited installation. A cost versus effectiveness analysis determines the feasibility of satelliting and aids in the selection of the optimal allocation of hosts and satellites.

In implementing the satelliting concept, it is necessary to designate the large centrally located installations as hosts, then propose configurations to place on these hosts, and finally select the satellite bases to be supported by each host installation. The objective is to satisfy the processing requirements of each installation and to do it at minimum total cost.

The processing requirements of each installation can be determined from an analysis of the anticipated workload data. From the operational use hour limit derived in the previous analysis, it is possible to determine the number of day and evening hours available per day. The workload data provide the number of real-time transactions to be processed on each installation per day. From this, the number of hours of real-time processing can be computed. The workload data also supply the necessary information on the requirements for batch processing, both concurrent and nonconcurrent. Nonconcurrent processing is that which has to be accomplished after the real-time period, since the reports generated might query the status of the data banks used in the real-time process. The total processing requirements are then determined from the sum of the batch concurrent, batch nonconcurrent, and real-time requirements. The number of remotes required at each installation can be determined from the location of organizations requiring immediate access to the computer, the number of real-time transactions, and the response time required on each transaction.

The evaluation of each of the possible alternatives is infeasible in large problems because of the numerous combinations of hosts, satellites and configurations. The derivation of an analytic technique to find the optimal allocation procedure proves to be not only impractical but unnecessary. Policy requirements designate certain installations as hosts and influence the size and capability of the configuration for these installations. The capability and reliability of communications equipment limit the number of host possibilities for each satellite. Nevertheless, it is still necessary to select the optimal allocation of satellites, constrained by the amount of excess computer time available at the hosts. Within these constraints, the satelliting scheme, which corresponds to minimum total systems cost, will be selected. Systems cost is here defined as the sum of the configuration costs plus the total cost of satelliting.

Selecting the Optimal Satelliting Scheme

In order to determine the cost of implementing the concept of satelliting, the analyst begins by dividing the set of installations into smaller subsets. This division may be imposed by policy requirements or by natural constraints, such as the reliability of communications equipment. Each subset can then be considered as a separate problem to be suboptimized.

For each subset of installations, the analyst will designate certain installations as hosts and determine the configuration to be placed on the hosts. At this point, an analytic technique must be derived which will determine the optimum allocation of satellites to hosts for each subset of installations. Any model developed must provide for constraints on real-time, batch nonconcurrent, total processing, and remotes for each host. The system is also constrained by the fact that each satellite must select one and only one host. Within these constraints, the object is to minimize the total cost of satelliting. The allocation of satellites to hosts that corresponds to minimum cost may be determined through the use of the mathematical analytic techniques. For

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each subset of installations, the total cost of the program is the cost of the configurations at the hosts, plus the satelliting cost incurred for each satellited installation.

It is obvious that through this analysis, the effect of assigning different configurations to the host bases can be determined, in addition to evaluating the effect of changing the division of satellites and hosts. Finally, the initial scheme used to subdivide the installations may be changed and all of the aforementioned parametric tests performed again. This type of model may be used to test the relative cost effectiveness of two configurations of the same vendor or similar configurations of different vendors. Parametric studies, which vary the constraints on the processing equipment variables, will determine the effect of changes in workload on the total system's cost.

From this type of analysis, the most cost-effective satelliting scheme can be determined. Since these are utilization costs that must be considered in the total analysis, they will be used in estimating the total cost of the computer equipment to the Air Force.

Cost-Effectiveness Techniques

The consideration of this type of analysis shows a different facet of the 250-hour criterion. A firm measure of operational use hours is a valid criterion, and is extremely useful as an overall measure of performance in cost-effectiveness studies. As a mandatory requirement, this criterion has major analytical implications and is critical to the one-step selection process. If it were ignored, then the relative merits of life-cycle costing would be difficult to achieve. This is true because of the nature of cost-effectiveness analysis. These mandatory requirements are measures of effectiveness by which comparisons may be made, and the criteria are then measures of merit or benefit.

In this review of the source selection process, consideration has been given to just one part of the analytical process which is necessary to provide useful information to the decision makers. Another complication, which might have been introduced to the preceding analysis, would have been the consideration of a discount rate on a lease versus buy analysis as a function of the rate of growth of the management system's requirements. The one-step selection process makes careful analysis imperative, and demands that mandatory requirements be met in full by the vendors.

This article has centered on the cost-effectiveness evaluation performed in the source selection process. It has also considered satelliting as an example of a suboptimization technique. When complete, the total process, including the results of the live test demonstration and the various analyses, is then evaluated and submitted to the Source Selection Advisory Council for recommendation on the selection. The council must determine if the vendors' proposals were evaluated in a consistent manner, and advise the source selection authority as to which proposals are within the competitive range. Its recommendations are presented, through the review process, to the source selection authority to assist in his decision.

Reasons for One-Step Selection

Many questions are raised as a result of the rigorous analysis performed during the one-step evaluation process. The Air Force established these procedures and laid down these rules because of unfortunate experiences in the past with unredeemed promises of technical performance. The current one-step procurement procedure was developed as a result of these experiences. Each participant is judged objectively and fairly in line with the rules set forth well in advance of the deadline for submission of proposals. Judging from previous electronic data processing equipment selection experience, a multiple step technical evaluation allowing for extended negotiation and correction, followed by price competition and selection, has the character of a paper competition. It provides promises of technical accomplishment and performance, rather than demonstrable evidence that contractual definition of requirements is fully understood and can be met. Air Force experience in this type of competition has been disappointing, both in product and service provided, and in ultimate price paid. Since the desired implementation dates have been determined by our commanders' and managers' needs and are part of the overall Air Force planning process, any significant delay may degrade the Air Force's capability to perform its mission.

For these reasons, the Air Force has selected the benchmark approach, with the RFP stipulating both mandatory requirements and a definitive time limit for meeting these requirements. Under this one-step selection process, all vendors have an equal chance, as required under the competitive procurement law.

Summary

Certainly, there are lessons which could be gleaned from the discussion in this article. First, the lowest bidder, in terms of initial procurement costs, may not necessarily be the winner. However, a competition run on the basis of life-cycle costs does not depart from the rule that contracts must be awarded to the low bidder. The initial low price bidder is not necessarily the low system bidder when costs, other than initial acquisition price, are taken into account.

There is obviously a major impact on both the engineering and sales practices of the suppliers. Also, these costing techniques require data and analytic methods not necessary when the lowest bidder was selected. However, the Armed Services Procurement Law specifically states that the award shall be made to the responsible bidder whose bid will be most advantageous to the U. S. Government, price and other factors considered.

One of the many methods of dealing with this selection process is to submit more than one system in response to a given RFP. In fact, a vendor could submit a series of hardware/software combinations, each a bit more powerful and expensive than the previous to a point where the performance is well above requirements. Thus the vendor would have so bracketed the combination of technical performance and cost as to be

(*Continued on Page* 23)

FROM THE SPEAKERS ROSTRUM

Address by Hon. Robert A. Frosch, Asst. Secretary of the Navy (Research & Development), to the 1967 Electronics and Aerospace Systems Technical Convention, Washington, D.C., Oct. 17, 1967.

F–111B Development

Today I will discuss the technical status of the F–111B and in particular some aspects of its development during the past few years. In order to clarify its current status, I will begin with an account of Navy aircraft test procedures as they relate to development philosophy.

In order to be certain that difficulties in the development of an aircraft are identified for correction as soon as is possible in the development cycle and to assess the basic aeronautical qualities of the airplane, the Navy has its own test pilots fly a sequence of tests called Navy Preliminary Evaluations (NPE). Five such flight series are normally flown. These are not, in any sense, acceptance tests, but rather are intended to identify problems and potential problems very early in development so that they may be corrected. The test pilots try to find all the problems they can, regardless of how minor they might be. They comment only on the plane actually flown; it is not their responsibility to, and they do not try to, identify ways of correcting the problems they find, nor do they usually speculate on the prospects for doing so.

The test articles, used for acceptance of the aircraft at the end of development, are flown in a sequence of trials run by the Navy Board of Inspection and Survey (BIS). It is only these BIS trials that can be described as acceptance tests.

The Navy test pilots, who fly preliminary evaluations, are an extremely competent, professional and dedicated group of men. We are proud of them and delighted with their hard-nosed attitude which, by early identification of problems, has saved the Navy a tremendous amount of trouble.

The NPE report is intended for the test agency, procuring agency, and contractor. The professional airplane developers, in each of those organizations, recognize the special nature of the report for its intended use as a management tool to expedite corrective action, if considered necessary by the procuring agencies. The procuring agencies are aware that the test agency writes the report, based on the test article at the test time, without regard for corrective action which may already be approved, but has not yet resulted in hardware changes. It is the responsibility of the procuring activity and the contractor, not the test activity, to initiate corrective action or to determine, as often happens, that none is required. The report is not generally intended for public or Congressional use. It is written for professional use without the explanations and qualifications, which are understood by the aeronautical professionals, but should be added if it were intended for a wider audience.

Recently there has been considerable hubbub in the press and Congress over comments extracted from a recent F–111B Phase I NPE. Various newspapers, in articles and editorials, have commented on these Phase I NPE results. Remember that a Phase I NPE is purposely placed as early in development as the airplane can be flown, in order to provide for early detection of difficulties.

To convey to you the "flavor" of such a Phase I NPE report, I would like to quote from such a report. The following are excerpts from a list of deficiencies characterized as "correction mandatory:"

- "Inadequate lateral control effectiveness in configuration Power Approach (the configuration of the aircraft during carrier landings) at normal approach airspeeds.
- "General airframe buffet in configuration Power Approach.
- "Unreliability of afterburner lightoffs with JP–5 fuel above 35,000 feet.
- "Windshield distortion in the vicinity of the stress strap and the resultant restriction to forward field of view.

F–111B Aircraft

- "The excessive distance between the pilot and the control stick.
- "Slow longitudinal trim rate.
- "Inadequate damping of residual directional oscillations.
- "Inadequate stall warning in configuration Power Approach.
- "Nose wheel shimmy.
- "Random engine exit nozzle opening and closing when modulating at minimum afterburning.
- "Location of the speed brake and microphone switches."

Quoting from the same report, in the section relating to prospects of meeting contractual guarantees, ". . . the following guarantees will probably not be met or their attainment is questionable:

- "Time to accelerate from maximum velocity at military rated thrust to 1.2 IMN at 35,000 feet.
- "The specific range at 40,300 feet.
- "Subsonic combat rated thrust combat ceiling.
- "Maximum velocity at military rated thrust at 35,000 feet.
- "Time to climb to 35,000 feet using combat rated thrust."

These quotes add up to an airplane which, unless modified, would give pilots at least considerable difficulty in carrier landings, if they could be made, and an aircraft with some real problems in combat flight. The quotes I have just cited are not from the recent F–111B NPE; they are, in fact, from a Phase I NPE of the F–4 fighter plane conducted in the fall of 1958. There were also a number of complimentary remarks about the aircraft and its other flight properties. After those remarks were made, the F–4 proceeded through the other phases of development, passed its BIS trials, and was introduced into the Fleet in December 1960. It has performed well there, is recognized as the best fighter available in the free world today, and the basic design has been applied to Air Force variations which are today being purchased in greater numbers than Navy versions. We, therefore, have a clear example of the flavor of a Phase I NPE which, if quoted out of context, could indicate a bleak future for the F–4. With hindsight, it is evident that the F–4 future was considerably better than the quotations above would indicate because the NPE comments assisted in the achievement of this successful weapon system.

Relative to the F–111B, the general concept of commonality itself was not really a new or foreign thought. We have proven in the F–4 program that Air Force and Navy airplanes, with similar mission requirements, can be successfully used by both Services. We have recognized within the Navy the desirability of commonality and have pursued it in such programs as the A–1 Skyraider.

Commonality Not a New Concept

It was produced in attack versions, airborne early warning versions, electronic warfare versions, and utility versions. We have demonstrated economies in the S–2, C–1 and E–1 airplane families by common engines, common subsystems, and nearly common airframes for different missions. We are today pursuing that logical course of action utilizing the basic A–6A design to create the EA–6A and, with further variations, the EA–6B. We are considering a tanker variation of the same airplane, called the KA–6D. All of these examples are given to emphasize that the basic concept of airframe, engine and avionic commonality, leading to variations of the same airplane with different uses, has long been recognized and understood within the Navy.

The design of the F–111B was challenging, but the variable sweep wing and afterburning turbo-fan engine made it appear possible to incorporate, in the same design, characteristics necessary to meet both Air Force and Navy requirements. This was a somewhat more radical approach to commonality than had previously been tried, and one which put rather more severe problems on the shoulders of the initial design engineer. The contractor analyzed designs for each small element that were essentially three designs; one to meet only the Navy requirements, one to meet only the Air Force requirements, and the third as the best way of satisfying both requirements. Because of the magnitude of the development and the ever present publicity attendant in this program, the contractor designed so as to insure that each new feature would indeed perform as planned, and that neither Service would find its requirements neglected.

Confronted during manufacture of the first three aircraft with the inescapable conclusion that the aircraft would be heavier than desired, the contractor initiated a massive redesign effort which has been described as the Super Weight Improvement Program (SWIP). This redesign, effective at F–111B number four, was instituted before the first Navy aircraft was delivered. The first three aircraft were in fact overweight, and much heavier than number four, approximately 3,000 pounds heavier. It is useful to ask whether the first three F–111B aircraft (which were known to be unrepresentative at the time of their acceptance) were a waste of money. As a matter of fact F–111Bs numbers one through three are in active use today as avionics and Phoenix test beds. All of these tests are required and all of the aircraft are usefully occupied. Accepting no F–111B aircraft until the first SWIP version was available would merely have delayed the avionic and Phoenix testing without improving the program. The weight of the aircraft is of little importance for this testing, but other basic properties and shapes are important to it.

The redesign effort produced the weight-improved, or so-called SWIP airplanes, F–111Bs number four and number five. We immediately utilized Navy number four as the demonstration airplane to validate, with contractor pilots, flutter and structural qualities of the SWIP design. While number four F–111B opened the permissible flight envelope, number five was prepared for a Phase I NPE essentially as if it were a new aircraft. Before this NPE there were many known F–111B characteristics and problems based on the flight testing of the pre-SWIP airplanes. In spite of the SWIP effort, prior to the NPE date, we had determined that higher thrust engines and other configuration changes would, in all probability, be necessary. However, the Navy desired a new and independent evaluation of the airplane which was much more representative of the expected end product of the research and development effort. The NPE was conducted, as always, on the hardware available. Improvements required and designed for later airplanes, but which were not yet incorporated in the test aircraft, were not considered.

Examples of deficiencies that were found in that F–111B NPE, and which were termed "correction mandatory," are quoted as follows:

- "Unsatisfactory lateral-directional handling qualities in the high-lift configuration with Adverse Yaw Compensation which degrade the night shipboard recovery capability.
- "Repeated occurrence of afterburner blowout and unsuccessful afterburner selection at conditions well within the NPE operating envelope.
- "Inadequate pilot's external field of view at the guaranteed minimum usable approach speed.
- "Unacceptable feedback of the Stability Augmentation System in the primary flight controls.
- "Unsatisfactory characteristics associated with extended speed brake operation.
- "Inadequate taxi turning capability for carrier operations.
- "Low excess thrust for acceleration from loiter flight conditions with maximum afterburner.
- "Unsatisfactory airplane tip-back characteristics.
- "Inaccessible location of the Control System switch which incorporates standby gain provisions.
- "Lack of fire extinguisher in the crew module.
- "Susceptibility of the crew module escape system to damage by personnel stepping on the wing glove area of the module. (The approved walkway areas are not adequately delineated. Existing 'NO STEP' markings are sporadically placed and confusing.)"

From the same report the following recommendations and conclusions apply:

- "Extensive simulator evaluation of the F–111B cockpit with the complete weapon system's displays and pilot's primary flight displays is essential to determine the suitability of the cockpit design concepts.
- "Supplementary solutions to eliminate multiple images in addition to increasing windshield incidence should be investigated.
- "The windshield 'critical area' should be redefined in accordance with carrier visibility requirements vice Air Force optical gunsight requirements."

If you recall the list of F–4 NPE problems I went through earlier, you will find some of these familiar.

Within the same report, as in the case of the F–4 report quoted before, estimates of the probability of meeting contractual guarantees indicated some would probably not be met. Because of the timeliness and classification involved, I prefer not to discuss the exact details.

The question which immediately comes to mind is, "How serious are these comments?" Analysis of them indicates that they range from easily corrected minor problems to limitations that may persist to some degree despite our best efforts.

How Much Correction Is Enough?

The problems we face in deciding exactly how much correction is enough are more complex than might appear at first look. For example, we all agree that the pilot should have a good view over the nose of the airplane in order to effect a carrier landing. (This has been a perpetual problem; some aircraft used to approach the carrier almost sideways for this reason. The F–4U, or Corsair I, was a classic example of this.) In the F–111B we found problems with the industry standards in defining precisely where the eye of the 5 to 95 percentile pilot should be in order to insure adequate vision. In order to define a satisfactory "fix" for this problem, we had to discard the industry standard, which was misleading, and substitute a more stringent one.

Another example is the standard geometric description of the tip-back tendency, which relates the airplane center of gravity to the deck contact point of the main wheels. We find that variations in braking ability and aircraft inertia characteristics, in actual practice, require us to modify the simple geometric definition of what is a usable tip-back configuration.

Our experience with the F–111B is giving us new insights into the writing of specifications for aircraft. It must be remembered that, at best, a specification is only a capsule description of what we want; some numbers extracted from a vast mass of qualitative and quantitative desires.

At this time, we have the following corrections which will be in succeeding Navy F–111Bs in engineering design:

- An improved engine to provide additional thrust throughout the flight envelope. This engine is designated the TF–30–P–12 and will be in F–111B number six and subsequent aircraft.
- A visibility improvement package which raises the pilot's seat, modifies the windshield angle, and increases the flap deflection, all three working in concert to improve over-the-nose visibility during landing. The flap fixes will be incorporated at Navy number six, with the cockpit changes introduced at Navy number eight and retrofitted to Navy number six.
- A redistribution of weight and a movement of the landing gear aft which will improve the present tip-back properties of the aircraft. An extended nose will be in all aircraft after Navy number six. The landing gear modification will be effective in Navy number eight with simple retrofit to Navy number six.
- The extended nose, referred to above and introduced to improve weight distribution, will be used to house the Phoenix airborne missile control system in a more accessible location. At the same time the volume, previously occupied by the Phoenix and other avionics, has become available and permitted installation of an additional 2,000 pounds of fuel. This change will be effective in Navy number six. The additional fuel provides increased loiter time.

The point most often raised in Congress and most media releases is whether the aircraft is indeed carrier suitable. Carrier suitability could be defined as the appropriateness of the vehicle to exist in the carrier environment. Obvious questions, such as adequate deck strength, have been considered, and there is no problem in the supercarriers from which we expect to operate the F–111B. The elevators in the Forrestal and subsequent carriers are updated as all aircraft loads increase, and are expected to create no problem at fleet introduction with the weights anticipated. The updating of elevators in these carriers was undertaken and is being carried out for reasons that are fundamentally independent of the F–111B. A program of catapult improvements in Kitty Hawk and subsequent carriers has been carried out to improve their capability to handle all aircraft at lower catapult wind-over-deck. These improved catapults will constitute the majority aboard the intended carriers at fleet introduction of the F–111B. The capacity of the remaining catapults, cited in the original F–111B specification, will also be adequate to handle the aircraft.

Is F–111B Carrier Suitable?

The previous properties cited have been carrier characteristics necessary to match airplane characteristics. Directly associated with them are the airplane characteristics to match the carrier. The variable sweep wing has its most obvious advantage in landing and takeoff, and is an important innovation in the F–111B. Because the energy requirements to catapult or arrest are concerned with kinetic energy in which, of course, the veolocity enters as the square while the mass enters linearly, the low-speed landing and takeoff characteristics of the F–111B, due to the high lift in the wing-forward configuration, more than adequately compensate for the increased mass. Comparable weight carrier aircraft, such as the RA–5C and A–3B, do not benefit from this feature and, thus, impose higher loads on the carrier when operating at equivalent mass to the F–111B. The F–111B is expected to land and takeoff at speeds about 15 to 20 knots less than the F–4 and RA–5C.

Curiously, the success of this high-lift feature has created a problem. The airplane has sufficiently high lift and low drag and speed in the landing configuration that on the glide slope the engines have had to run very near idle, with the result that the response of the aircraft in this state is too sluggish. A few minor changes appear to be sufficient to correct this problem.

We are preparing to take F–111B number five aboard an aircraft carrier sometime during the spring of 1968. While we are aware of shortcomings in that specific aircraft, which will be corrected in succeeding airplanes, we believe it is necessary to test the F–111B in its intended environment as soon as possible. There is no substitute for appropriate full-scale testing in any development program. This testing will not commence until laboratory structural tests (now scheduled on a test article in November) and land-based tests, using catapults and arresting gear installed at Naval Air Station, Lakehurst, N.J., and Naval Air Test Center, Patuxent River, Md., are complete. The latter testing is scheduled to start in January 1968. Thus we are building up to initial carrier trials in our usual straightforward and careful manner.

About a year later than the initial trials with F–111B number five, a production-representative aircraft, with all the fixes I have previously enumerated, will conduct more involved and complete carrier tests.

As I discuss the F–111B airplane today, we are more than two years away from the BIS trials which I referred to earlier as the true acceptance trials. We have many engineering changes to be incorporated, many development steps to be taken, and much more quantitative flight testing to be performed to perfect the configuration. There will be other NPEs embracing a larger flight envelope and more internal components of the complete weapon system. Of course, the testing to date has established a high probability of acceptability of the basic aerodynamic qualities. After the contractor demonstrations and NPEs are complete as prerequisites to BIS trials, some four or five uninstrumented production airplanes will be designated as BIS aircraft. They will be tested at the Naval Air Test Center, Patuxent River, Md., and the Naval Missile Center, Point Mugu, Calif. At about the time those trials are in progress, another set of production-representative aircraft will be assigned to the Operational Test and Evaluation Force (OPTEVFOR). The OPTEVFOR airplanes will be used to develop and refine the tactics the Fleet will use when operating the F–111B/Phoenix weapon system.

At the end of BIS trials, delivery to the Fleet will begin with initial deliveries to a Replacement Training Squadron. From that squadron, in due course, will come the trained personnel to man the first deployable fleet squadron.

The fleet introduction, described above, will take place within the year following BIS in the configuration established during development, and proven acceptable in the BIS trials.

Mission Capability

Having discussed the suitability of the aircraft and its state of development, I will address its mission capability. The Navy mission capability for the F–111B has always centered around the long-range missile carrying and multiple missile firing capability of the airplane/missile combination. The Navy requirements, as they were conveyed in specification form to the contractor, detailed five design missions. The first of these was the fleet air defense mission which is still our primary mission. The second of these employed the Phoenix in a distant air superiority role, such as over a beachhead. The third, fourth and fifth missions capitalized on the long-range performance of the airplane to deliver nuclear and conventional bombs. We expect the aircraft to be capable of performing the fleet air defense mission as defined, and capable of performing flight to a distant beachhead area where, supported by appropriate Marine Tactical Data Systems or Airborne Tactical Data Systems, it will provide an effective distant air superiority capability.

While the remaining missions which deliver nuclear and conventional bombs can be performed by the F–111B, they have become less important Navy requirements for the F–111B.

With regard to the fighter role, we must begin by considering what a fighter is. This is a current problem. The concept varies from Snoopy and Red Baron (with white scarf trailing out behind, as in the Peanuts comic strip) through something in order of the YF–12 Mach 3 fighter, proposed for continental air defense.

The letter "F" in the military airplane designation simply means fighter, and we use that designation for fighter bombers, some of which are intended for traditional dogfights, and some not.

Limited-range fighters, such as the F–5A, and extremely long-range fighters, such as the F–111A, have considerably different characteristics. The F–111B was designed to fill the fleet air defense role which is essentially the fighter interceptor role. In such a role, it is supported by systems, such as the Airborne Tactical Data System (now carried in the E–2A), the Naval Tactical Data System, and the Marine Tactical Data System when near a beachhead. Assisted by these tactical data systems, it performs more nearly a function corresponding to that of the fighter interceptor in the Continental Air Defense Command, which operate under guidance of numerous control nets.

In 1966 the Chief of Naval Operations conceived a study of the F–111B in its primary fleet air defense role as an interceptor. The aerodynamic characteristics of the assumed fleet F–111B aircraft were purposely viewed in a pessimistic manner, compared with both contractor-supplied characteristics and the original specifications. The F–111B/Phoenix was compared with the Phoenix system carried in subsonic aircraft, with other fighters with other missile systems now visualized for the appropriate future era, and with variations of those other fighters which showed promise. The study employed the latest in dynamic simulator techniques, and used a base of knowledge about this aircraft and competing systems which we have established over many years.

It was the finding of this elaborate formal examination of the problem, and the judgment of the Naval officers who ran it, that the F–111B/Phoenix system, on a deck-space and cost-effectiveness basis, was a better system for the fleet air defense role than any comparable system which could be introduced in the same time frame. We feel confident that this study has indeed shown, as well as anything but operating experience can, that this airplane, equipped with its Phoenix missile system, will provide effective fleet air defense, and will meet the military requirements that led to its development, even if it does not meet all of the specifications that were the contractor's guaranteed estimates of what the aircraft would do. The relative cost-effectiveness advantage of F–111B/Phoenix over competing systems is greatest for the more serious threats to the Fleet. For lesser threats, the requirement for a complex fleet air defense is smaller and the other systems become more competitive. However, we find it necessary today, as in the past, to plan for threats which the potential enemy is capable of launching, and this must include the serious and sophisticated threats.

We have treated this Chief of Naval Operations study to sensitivity analyses for possible degradations in aircraft performance and modifications in cost. When all the elements of predicted 10-year operating costs, deckspace allocation, and effectiveness against threat (including variations up to the highest threat that we believe could be mounted) are considered, we find that it meets our fleet air defense requirements better than any competing system available for study.

It now appears inappropriate to consider the F–111B as competing directly with the subsonic A–7 carrying conventional bombs. We are examining instead the possible employment of the F–111B as a missile platform in attacking with air-to-surface missiles with large stand-off ranges. In this role, its potential as a well equipped avionic platform with excellent performance, and its ability to return and land with unexpended expensive missiles provides advantages that none of our other aircraft can match. We have not yet completely defined this new secondary role for the aircraft which, in any case, would require the airplane to use stand-off missiles that have not yet completed development nor reached the Fleet.

Hon. Robert A. Frosch

In summary, we gave the contractor (and he accepted) a very tough requirement to meet, if he was to provide all the performance desired by the Navy and by the Air Force in the designs he initiated. As we examine the situation some years later, we find that the aircraft will probably not meet all of the initial specifications, and the contractor will have to accept some responsibility for this lack. It is, of course, not unusual for a military aircraft that uses advanced state of the art to fail to meet some of the specifications. The real question is whether it meets military needs. We have examined whether the F–111B continues to meet the original primary military mission requirements, and we are convinced that, in its primary air defense interceptor role, the F–111B, equipped with the Phoenix airborne missile control system and firing multiple shots of the long-range Phoenix air-to-air missile, represents the finest fleet air defense system available in the immediate future.

The F–111B is now in the state of development where we are satisfied that the basic problems have been solved, and that we have identified other design problems for which solutions are in progress. The overall success of an airplane is determined over the long run by how the system meets a solid military requirement. We are heartened by the fact that the Air Force now appears to be bringing its version of the F–111 into the operational inventory in a highly successful manner.

We base our expectation that the F–111B will be a satisfactory, carrier-suitable aircraft for its mission partly on the fact that corrections for the deficiencies, discovered in the first serious flying of its development, have been identified and designed; and partly on a historical record that tells us that mandatory deficiencies, frequently of a major kind, are normal in development aircraft emerging from Phase I NPE. In past development these have been corrected, with the result that we fly highly satisfactory aircraft in the Fleet.

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U. S. Army Metrology and Calibration Center Activated	10	Nov.
USAF Civil Engineering R&D Goes to Kirtland AFB	23	Aug.
USAF Sole Manager of Liquid Propellants	29	March
PROCUREMENT		
AFLC To Test New Contract Logistics Support Concept	bk	Nov.
Bids Invited on New Weather Computers	12	March
Contracts Awarded by Air Force for VTOL Flight Control System	21	Jan.
DESC and AFSC Study Standardization of Electronic Parts	bk	Sept.
M16A1 Rifle Adopted as Standard Army Rifle	bk	June/ July
Oklahoma City AMA Gets A–7D Logistics	40	Jan.
SPCC Given Role in Navy's Deep Submergence Program	17	Nov.
Two Generators Earmarked for Procurement by Army	14	Nov.
PUBLICATIONS		
Clearinghouse Adopts New Document Sales System	32	March
Contract Definition Reports Available	ib	March
DOD Instructions and Directives Now Available Through Subscriptions	25	Oct.
Foreign Military Sales Pamphlet Available	11	Oct.
Inspection Systems Handbook Available	32	March
Naval Terms Dictionary Available	10	April
New Policy Set for Announcing Defense Documents	16	Oct.
RESEARCH AND DEVELOPMENT		
Ad Hoc Group on Concept Formulation Established	ib	Nov.
AF Missile Center Gets Three-axis Flight Simulator	20	March
AFSC Electronics System Division Gets Key Role in Development of TACSATCOM	bk	June/ July
Air Force Awards Six Contracts for V/STOL Transport Design	20	March
Air Force Flight Control Research May Extend Aircraft Life Span	bk	Jan.
Air Force Tests New Gyroscope	ib	Feb.
Army-Air Force Study Combat Hazard	bk	Jan.
Army Evaluates New High Speed Teleprinters	29	March
Army Tests New Amphibious Lighters	21	May
Continuous Wave Laser in Operation at Redstone Arsenal	bk	Aug.
Dynaplane Boat Design—Less Drag—More Speed	13	Nov.
Foam Reduces Fire Hazards	27	Nov.
Navy Begins Test of Computing System	21	June/ July
Navy Conducts Simulated Deep Ocean Dives in Preparation for SEALAB III	24	Jan.
Navy Develops New Fire-Fighting Foam	23	Aug.
Navy Gets New Shark Repellent Device	13	March
Navy Lab Tests Inflatable Tent	16	Sept.
New Amphibious Vehicle Under Development	ib	March
New Antenna Concept Studied by AFCRL	12	March
New Attack Aircraft To Be Evaluated in Vietnam	16	Oct.
New Navy R&D Facility Features Huge Spin Chamber	bk	May
Oriental Characters Now Speedily Produced with New Photo Composing Unit	11	March
Project Hindsight—An Interim Report	9	Jan.
Project Themis—30 Universities To Do Research Projects for DOD	27	Oct.
Prototype of Deep Ocean Rescue Craft Due in June 1968	12	March
Re-entry Communications Blackouts Studied	12	March
TACFIRE Definition Phase Contracts Awarded	33	Sept.
USAF Scientists Develop New High Temperature Ceramic Coating	29	March
SECURITY		
Disposition of Program Material Explained	12	April
Industrial Security Award Winners Announced by DSA	ib	Feb.
Industrial Security Excellence Cited	14	Nov.
Industrial Security Management Course Sessions Scheduled	5	May
New Requirements for Classified Storage To Become Effective in March 1968	21	June/ July
Over Classification Increases Cost	21	June/ July
Security Briefings a Must for Paris Air Show	32	March
SHIPBUILDING		
Evaluation of Proposals Completed for Navy's FDL Ships	bk	Sept.
Navy and Commerce Departments Agree on Surface-Effect Ship Plan	bk	Oct.
Navy Shipbuilding Program for FY 1967 Announced	21	March
Prototype of Deep Ocean Rescue Craft Due in June 1968	12	March
Study Group Formed To Examine Future Construction of Navy Escort Ships	if	March
WATER POLLUTION		
Army Engineers Launch Fight Against Water Pollution of Waterways	24	Sept.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

The Advanced Research Projects Agency has announced the appointment of **Dr. Alan S. Tetelman** as Dep. Dir. of its Materials Sciences Office. He succeeds **Dr. Alan D. Franklin** who has returned to the National Bureau of Standards.

Col. Rodger R. Bankson, USA, has assumed the post of Dir. for Defense Information, Office of the Secretary of Defense (Public Affairs).

Col. Paul P. Dailey USA, has been named Dir., Terminals and Installations, at Military Traffic Management and Terminal Service headquarters, Bailey's Crossroads, Va.

DEPARTMENT OF THE ARMY

Maj. Gen. Robert E. Coffin has succeeded **Maj. Gen. William C. Gribble** as Dep. Chief of Research and Development, Headquarters, U.S. Army.

Brig. Gen. H. G. Davisson, Commander, White Sands Missile Range, N.M., was promoted to the rank of major general effective Oct. 2.

Brig. Gen Roland M. Gleszer, Dir. of Management, Office of the Comptroller of the Army, was promoted to the rank of major general Nov. 1.

The following reassignments have been made in the Office of the Chief of Research and Development: **Col. Frank A. Bates Jr.** succeeds **Brig. Gen. George Sammet** as Executive; **Col. Thomas N. Chavis** fills the post of Dep. Dir., Missiles and Space, vacated by Col. Bates; and **Col. William J. Lynch** takes over Col. Chavis' former assignment as Asst. Dir., Army Research.

Other changes in the Office of the Chief of Research and Development include: **Col. Earl K. Buchan**, Chief, Air Mobility Div.; **Col. Joe B. Lamp**, Chief, Combat Materiel Div.; **Col. George R. O'Neal**, Chief, Communications-Electronics Div.; and **Lt. Col. David H. Thomas**, Chief, Resources and Requirements Div., Nike-X Systems Office.

Col. Clifton O. Duty has been reassigned to the Army Aviation Materiel Command, St. Louis, Mo., for duty as Dir., Procurement & Production.

Col Edwin T. O'Donnell has been named Commanding Officer, Research and Development Center, Army Mobility Equipment Command, Fort Belvoir, Va.

Col. Morris W. Pettit has been assigned as Project Manager, Nike Hercules Missile System, Army Missile Command, Huntsville, Ala.

DEPARTMENT OF THE NAVY

VAdm. John J. Hyland, Commander of the U.S. Seventh Fleet, has been named to the post of Commander in Chief, U.S. Pacific Fleet. Succeeding Adm. Hyland as Seventh Fleet Commander will be **RAdm. William F. Bringle**, who has been Dep. Chief of Staff, (Plans and Operations) under the Commander in Chief, U.S. Pacific Fleet.

RAdm. Eli T. Reich has been reassigned from duty as Asst. Dep. Chief of Naval Operations (Logistics) to the post of Dep. Comptroller of the Navy.

RAdm. Herman J. Trum III has relieved **RAdm. William E. Ferrall** as Commandant, Thirteenth Naval District, with headquarters in Seattle, Wash.

RAdm. Turner F. Caldwell has been assigned duty as Exec. Dir., Anti-Submarine Warfare Programs, in the Office of the Chief of Naval Operations.

Capt. Johns H. Behl has become Commanding Officer, Naval Weapons Services Office, Naval Air Engineering Center, Philadelphia, Pa.

Capt. Cecil C. Allen, SC, has been assigned as Officer-in-Charge, Atlantic Fleet Polaris Material Office, Charleston, S.C.

Capt. Alvin F. Emig has assumed command of the newly established Ground Support Equipment Department, Naval Air Engineering Center, Philadelphia, Pa.

Capt. Robert L. Wessel will relieve **Capt. E. B. Jarman** as Commanding Officer, Corona Laboratories, Naval Weapons Center, China Lake, Calif., in December.

DEPARTMENT OF THE AIR FORCE

Maj. Gen. Kenneth E. Pletcher has been designated the Surgeon General of the Air Force with promotion to the rank of lieutenant general. He replaces **Lt. Gen. Richard L. Bohannon** who is retiring effective Dec. 1.

Maj. Gen. Paul T. Cooper has been assigned duty as Vice Commander, Space & Missile Systems Organization (SAMSO), Air Force Systems Command. Gen. Cooper previously served as SAMSO Dep. Commander for Space.

Maj. Gen. Robert H. McCutcheon has been named to replace retiring **Maj. Gen. T. Alan Bennett** as Commander, Ogden Air Materiel Area, Air Force Logistics Command.

Brig. Gen. William G. Moore Jr. has been assigned duty as Dir., Operational Requirements & Development Plans, Office of Dep. Chief of Staff (Research and Development), Hq., USAF.

New assignments in the Air Force Systems Command include: **Col. Richard P. Gingland**, Chief, Systems Acquisition, Space & Missile Systems Organization (SAMSO); **Col. William J. Henderson**, Dir., Vela Nuclear Detection Satellite Program, SAMSO; **Col. Norman J. Keefer**, Dir., Agena Program Office, SAMSO; **Col. Stanley M. Lockie**, Chief, Research & Technology, SAMSO; **Col. John A. Murphy**, Dir., Procurement & Production, Manned Orbiting Laboratory, SAMSO; **Col. Richard O. Ransbottom**, Dir., RC–135 System Program Office, Aeronautical Systems Div.; **Col. F. E. Rundell**, Dep. Commander, Air Force Armament Laboratory, Air Proving Ground Center, Eglin AFB, Fla.

New assignments in the Air Force Logistics Command include: **Col. E. H. Gordon**, Chief, F–4 Systems Support Management Div., Materiel Management Directorate, Ogden Air Materiel Area; **Col. George M. Lunsford**, Chief, Force Structure and War Plans Div., AFLC Hq.; **Lt. Col. Cecil G. Furbish**, Director of Information, AFLC.

HEADQUATERS,
OFFICE OF THE DIRECTOR

D

BGEN Frank E. G

DEPU

COL Thomas M. F

SPECIAL ASSISTANT FOR COMBAT ART

COL Raymond Henri	3204	41071

MARINE CORPS INFORMATION OFFICE LOS ANGELES

LTCOL David M. Ridderhof
6087 Sunset Boulevard
Los Angeles, California 90028
(213) 688-2520

ASSISTANT DIRECTOR FOR PUBLIC AFFAIRS

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PUBLIC AFFAIRS BRANCH		
LTCOL Verle E. Ludwig	3210	41492
PRESS SECTION		
1stLT Michael G. Pitts	3210	41492
RADIO-TV SECTION		
MAJ William Boone	3210	41493
COMMUNITY RELATIONS SECTION		
MAJ Robert G. Prebihalo	3210	41054
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CAPT Ronald L. Smith	3206	41495
ADMINISTRATIVE OFFICER		
1stLT Richard S. Sanborn	3206	41495
BIOGRAPHER		
MRS. Nellie E. Herring	3206	41495

December 1967

.S. MARINE CORPS
IVISION OF INFORMATION

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CAPT James W. Jones 201B HH 3 42857

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1stLT William H. Stuckey 106 HH 4 42354

VISUAL PRODUCTION SECTION

MAJ Gregory S. Prichard HH 23 43723

Division of Information is located in the Arlington Annex (Columbia Pike and Arlington Ridge Road, Virginia), Washington, D. C. 20380. Telephone: Area Code 202, OXford plus number listed.

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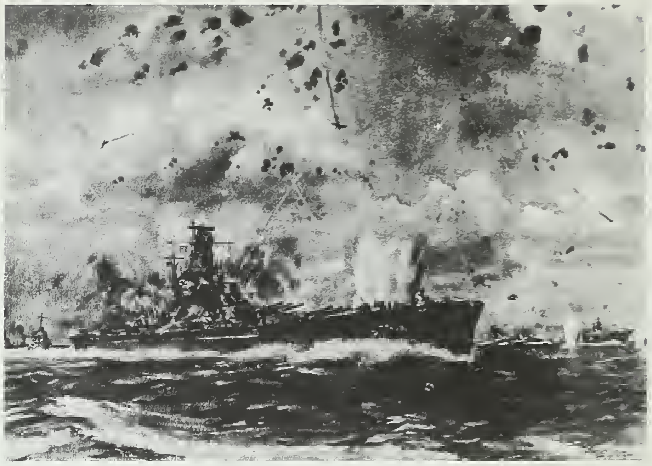


4

2

3

1. "Hook Down, Wheels Down" by James Scott.
2. "Beach Red" by John Groth.
3. "UDT Men" by Robert J. Benson.
4. "Air Defense" by Dwight C. Shepler.

Navy Makes Combat Art Available to Industry

The U.S. Navy's collection of more than 3,000 original paintings, sketches and drawings, created in a wide variety of media and techniques, is available for reproduction as calendar sheets, magazine and poster advertisements, book jackets, desk mementos, and other advertising uses.

The combat art collection's historical paintings range in subject area from World War I and II battle scenes to modern combat illustrations and impressionistic renderings of industrial and nautical facilities, people and places throughout the world. Some color separations are already available.

The collection is the property of the U.S. Navy and no releases from artists or payment of fees for reproduction rights are required. To obtain reproductions or further information on use of original art, write or call:

Office of the Chief of Information
Attention: OI–300
Department of the Navy
Room 2E 335, The Pentagon
Washington, D.C. 20350
Telephone: (202) OXford 7–7221

SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS

(DOLLARS IN MILLIONS; MANPOWER IN THOUSANDS; QUARTERS BY CALENDAR YEAR)

	1966				1967								
	I	II	III	IV	I	Apr	May	Jun	II	Jul	Aug	Sept	III
I. Military Prime Contract Awards													
Aircraft	$ 1,945	$ 2,989	$ 2,696	$ 2,262	$ 2,102	$ 432	$ 1,240	$ 1,377	$ 3,049	$ 394	$ 636	$1,483	$ 2,513
Missile & Space Systems	1,040	987	1,314	861	1,230	300	260	606	1,166	535	521	524	1,580
Ships	355	491	876	239	679	72	129	206	407	178	104	135	417
Weapons & Ammunition	555	1,486	692	940	818	279	518	972	1,769	92	415	597	1,104
Electr. & Communications Eqpt.	918	1,574	666	915	971	480	338	1,030	1,848	169	364	283	816
Other Hard Goods	843	1,842	660	1,029	915	298	362	904	1,564	202	355	228	785
Soft Goods	709	922	1,078	989	638	171	199	282	652	588	280	188	1,056
Construction	207	392	198	150	232	126	160	340	626	56	100	76	232
All Other	1,406	1,963	2,356	1,639	1,605	517	507	963	1,987	1,194	568	573	2,335
Total (Excl. of work outside U.S.)	7,978	12,646	10,536	9,024	9,190	2,675	3,713	6,680	13,068	3,408	3,343	4,087	10,838
Total, Seasonally Adjusted	8,703	10,144	10,716	10,149	10,171	2,920	4,121	3,626	10,667	3,610	3,686	3,665	10,961
Work Outside U. S.	521	1,195	856	672	453	227	228	379	834	314	382	195	891
II. Gross Obligations Incurred													
Operations	8,326	9,604	10,426	9,702	10,229	3,664	3,531	4,239	11,435	3,700			
Procurement	4,374	8,539	5,368	5,276	5,113	1,801	2,485	4,663	8,948	1,045			
Other	2,429	3,470	3,453	2,230	2,519	726	1,130	1,653	3,510	1,246			
Total	15,129	21,613	19,247	17,208	17,861	6,191	7,146	10,555	23,893	5,991			
III. Gross Unpaid Obligations Outstanding													
Operations	3,828	3,777	4,792	5,024	4,644	4,761	4,765	4,513	4,513				
Procurement	18,023	22,119	22,736	23,173	22,780	22,613	22,947	25,248	25,248				
Other	5,747	7,392	8,179	7,888	7,626	7,453	7,628	8,270	8,270				
Total	27,598	33,288	35,707	36,085	35,050	34,827	35,340	38,031	38,031				
IV. Net Expenditures													
Operations	7,689	9,076	8,968	9,087	10,002	3,416	3,335	3,980	10,731	2,898	3,722	3,382	10,002
Procurement	3,651	3,886	4,392	4,264	5,074	1,783	1,850	1,649	5,282	2,037	1,982	2,041	6,060
Other	2,757	2,647	2,484	3,092	3,179	918	749	334	2,001	1,231	882	930	3,044
Total	14,097	15,609	15,844	16,443	18,255	6,117	5,934	5,963	18,014	6,166	6,586	6,353	19,106
V. DOD Personal Compensation													
Military	3,181	3,249	3,551	3,606	3,624	1,230	1,196	1,220	3,646	1,310	1,260		
Civilian	1,937	2,015	2,105	2,135	2,163	700	776	772	2,248	729	786 (p)	723 (p)	2,238 (p)
Total	5,118	5,264	5,656	5,741	5,787	1,930	1,972	1,992	5,894	2,039	2,046 (p)		
VI. Outstanding Payments													
Advance Payments	66	79	90	83	92				80				
Progress Payments	4,402	4,346	4,750	5,461	5,981				6,765				
Total	4,468	4,425	4,840	5,544	6,073				6,845				
VII. Strength (Manpower)													
Military	2,969	3,094	3,229	3,334	3,371	3,371	3,368	3,377	3,377	3,382	3,393	3,407 (p)	3,407 (p)
Civilian	1,088	1,138	1,184	1,230	1,268	1,273	1,274	1,303	1,303	1,311	1,306	1,274 (p)	1,274 (p)

p—preliminary

NOTE: Open spaces for Indicators othen than No. VI indicate information not available at time of publication. Indicator No. VI information available only on a quarterly basis.

Directorate for Statistical Services
OASD (Comptroller)
October 26, 1967

ARISTOTLE Symposium in Washington Dec. 6–7

The first ARISTOTLE Symposium, sponsored by the National Security Industrial Association, will be held on Dec. 6–7, 1967, at the Washington Hilton Hotel, Washington, D.C.

Project ARISTOTLE (acronym for Annual Review and Information Symposium on the Technology of Training, Learning and Education) was established as a result of a conference held in June 1966, co-sponsored by the National Security Industrial Association, the Defense Department, the Labor Department and the Office of Education, to provide a structure to encourage continuing communication and exchange of accomplishments within the government/industry/education communities.

The symposium will consist of two general sessions featuring presentations by key officials in education, industry and government. The topics of these sessions will be:

- Government, Industry and Education as Working Partners.
- What Education Wants from Government and Industry.

ARISTOTLE is structured into ten task groups consisting of voluntary part-time members. Panel sessions and workshops will present and discuss the many findings and developments of the task groups' efforts during the past year.

For registration and additional information, the contact is:

P. A. Newman
National Security Industrial Association
1030 15th St. NW
Washington, D.C. 20005
Phone: (202) 296–2266

U.S.-Japan Sign Agreement for Missile Systems

Japanese and U.S. officials have signed agreements in Tokyo for the production and procurement of military equipment for Japan's Self-Defense Forces.

The equipment includes three battalions of Hawk and associated missiles and supporting equipment to be produced in Japan.

Also included in the agreement is the procurement from U.S. sources of two battalions of Nike Hercules ground support and auxiliary equipment; production in Japan of Nike Hercules missiles; and procurement from the United States of another battalion of Nike Hercules equipment to be programmed in the Japanese FY 1972.

The Nike and Hawk programs play an important role in the Japanese Third Defense Buildup Plan covering the period Japanese FY 1967–1971.

Military Oceanography Symposium To Be Held in Florida

The Fifth Annual Symposium on Military Oceanography, sponsored by the Oceanographer of the Navy, will be held in Panama City, Fla., May 1–3, 1968.

Purpose of the symposium will be to provide an opportunity for scientists, engineers and military personnel to present papers, exchange information, and discuss problems concerning military oceanography. The sessions will be classified to facilitate free and open discussion.

Call for papers and applications for invitations will be issued early in January.

For information concerning the symposium contact:

Oceanographer of the Navy
732 N. Washington St.
Alexandria, Va. 22314

Navy/Marine Corps Research and Development Problems

The 1967 edition of the publication, "Navy/Marine Corps Research and Development Problems," is now available for distribution, without charge, to interested industrial firms educational institutions, libraries and individuals. It contains a compilation of problems for which the Naval Material Command and the Marine Corps are seeking solutions. The problems described fall into eight categories:

- Chemical Sciences.
- Electrical Sciences.
- Electronic sciences.
- Engineering Mechanics.
- Life Sciences.
- Material Sciences.
- Physical Sciences.
- Simulation and Training Technology.

The prime objective of the publication is to enlist the assistance, experience and ingenuity of industrial organizations and educational institutions toward obtaining fresh approaches, ideas and techniques.

Anyone interested in obtaining the publication should complete the form below, clip and mail to:

Chief of Naval Material
Attention: MAT 0541
Department of the Navy
Washington, D.C. 20360

Please send _______ copies of "Navy/Marine Corps Research and Development Problems" to:

Name ________________________________

____

Street or P.O. Box ________________________

City and State __________________________

Zip Code ____________

Army Redesignates Chief of C-E

The Army's Chief of Communications-Electronics (CC–E) has been redesignated the Assistant Chief of Staff for Communications-Electronics (ACSC–E), and will now report directly to the Army Chief of Staff.

With the redesignation, Army communication functions assume staff parity with personnel, operations, intelligence and logistics in the Army staff structure. The CC–E, as head of a special staff agency, formerly operated under the Deputy Chief of Staff for Military Operations.

Major General Walter E. Lotz Jr., present CC–E, will be retained as ACSC–E.

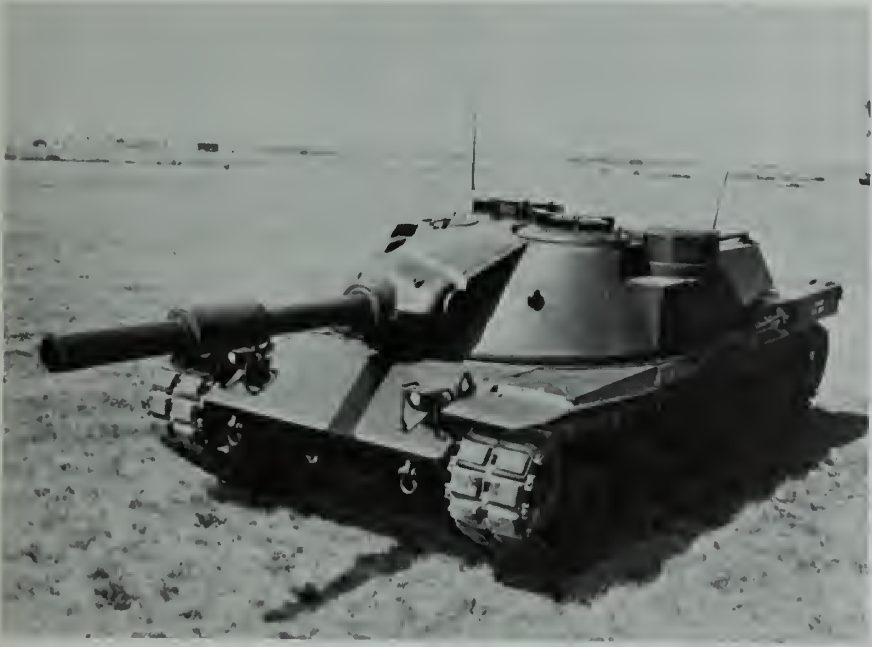
The redesignation results from an Army study which recommended elevation of the communications staff function to a higher level. The change is expected to improve the agency's capability to coordinate and manage the expanding communications function within the Army, as well as with other agencies and commands.

Notice Transit Symposium Delayed

The Navy Navigation Satellite System (Transit) Symposium scheduled to be held in Washington, D. C., on Nov. 30, announced on the inside back cover page of the November issue of the *Bulletin*, has been dlayed until early spring according to John H. Jorgenson of the National Security Industrial Association.

The technical information and documentation on the system's shipboard user equipment will be available beginning Nov. 30. A charge, estimated at $30 to $35, will be made to cover the cost of reproduction and mailing. Sales to foreign purchasers are subject to normal munitions control procedures and export control regulations. To obtain the material, contact:

National Security Industrial
Association
Department T
1030 15th St. NW
Washington, D. C. 20005
Phone: (202) 296–2266



MAIN BATTLE TANK–70 SHOWN—The Main Battle Tank–70, the most advanced armored vehicle ever developed for the U.S. Army, was unveiled during the annual meeting of the Association of the U.S. Army in Washington, D.C., in October. The radically new tank was developed jointly by the United States and the Federal Republic of Germany. Among the features of the MBT–70 are more accurate fire control, more powerful engine and improved armor protection.

INFORMATION PROCESSING SYSTEM

(*Continued from Page 7*)

truly competitive throughout the range of requirements. However, the system's requirements are tightly drawn and the benchmark test developed to measure these requirements. Because of this, the Air Force does not speculate with regard to potential performance of contractractors' systems not submitted in accordance with the rules governing the RFP.

The Air Force is continually working to improve the selection process. As the number of users of ADP equipment increases, the need for continuing refinement of user requirements becomes essential. In order to obtain the best computer system, the Air Force at the present time reflects the user requirements in the desirable features and the mandatory requirements of the RFP. One possible refinement to the present process would be to require that the user estimate variable future workloads and the probability of each of these workloads. This information could then be submitted to the vendors in the RFP. Responses could be designed for each workload level and evaluated by the expected cost concept.

The acquisition of management data processing systems by the Air Force is an integral part of overall DOD planning, programming and budgeting. The final objective is a family of management information systems, each accomplishing a particular mission, and each interfaced into a total structure to support world-wide Air Force management.

NSC Puget Sound Established

The Naval Supply Depot, Seattle, Wash., has been disestablished and its functions transferred to the newly established Puget Sound Naval Supply Center, headquartered in Bremerton.

Captain Stuart M. Ball, SC, former Commanding Officer, NSD, Seattle, will command the new organization, which will consist of three divisions located in Seattle, Bremerton and Manchester.

STATUS OF FUNDS

DEPARTMENT OF DEFENSE

Military Functions and Military Assistance Program

Quarterly Report

Prepared by:

Directorate for Financial Analysis and Control
Office of the Assistant Secretary of Defense (Comptroller)
Room 3C 839, The Pentagon Phone: (202) OXford 7-2332

NOTE: All expenditure amounts are on a net Treasury basis (gross payments less reimbursement collections), whereas obligations and unpaid obligations are on a gross basis (inclusive of reimbursable activity performed by components of DOD for each other). Therefore, unpaid obligations as of the end of the reporting month cannot be computed from other figures in this report.

Expenditures

Fourth Quarter, Fiscal Year 1967

(Amounts in Thousands)

Department of Defense

	Expenditures				Unpaid Obligations	
	April 1967	May 1967	June 1967	Cum thru June 30, 1967	At start of year	As of June 30, 1967
Military Personnel						
Active forces	1,519,695	1,363,806	1,756,253	17,054,184	589,609	850,076
Reserve forces	72,554	76,471	102,574	902,303	156,797	149,863
Retired pay	159,208	158,957	161,539	1,830,233	8,052	7,622
Undistributed	33,408	-16,752	-31,088	—	—	—
Total—Military Personnel	1,784,864	1,582,482	1,989,279	19,786,720	754,459	1,007,561
Operation and Maintenance	1,631,439	1,752,467	1,990,709	19,000,253	3,022,637	3,505,186
Procurement						
Aircraft	726,346	766,527	656,922	8,410,603	7,508,668	9,355,273
Missiles	172,627	182,236	163,114	1,930,380	2,083,027	1,929,015
Ships	139,200	142,697	147,165	1,398,402	2,867,571	3,049,781
Tracked combat vehicles	32,899	49,017	34,536	273,594	449,010	632,680
Ordnance, vehicles, and related equipment	414,707	485,460	428,293	3,977,610	6,110,216	6,721,730
Electronics and communications	119,229	109,368	158,480	1,284,265	1,855,134	1,998,176
Other procurement	228,986	180,617	209,222	1,688,578	1,582,769	1,947,502
Undistributed	-51,208	-65,860	-148,945	48,425	-337,631	-386,056
Total—Procurement	1,782,782	1,850,060	1,648,791	19,011,857	22,118,764	25,248,101
Research, Development, Test, and Evaluation						
Military sciences	81,057	90,840	88,333	1,009,665	891,487	867,381
Aircraft	70,858	78,973	67,992	1,031,435	539,278	796,125
Missiles	178,070	228,854	231,877	2,377,028	1,097,218	1,095,907
Astronautics	73,388	90,422	107,238	979,705	599,546	649,793
Ships	20,796	19,142	18,999	296,285	204,792	212,773
Ordnance, vehicles, and related equipment	32,860	26,817	26,529	343,106	237,072	235,442
Other equipment	58,050	64,044	61,184	658,012	480,164	541,757
Program-wide management and support	25,525	27,016	36,683	416,242	154,656	163,038
Undistributed	7,992	18,546	-85,587	48,189	-145,833	-194,032
Total—Research, Development, Test, & Evaluation	548,594	644,654	553,250	7,159,668	4,058,380	4,368,185
Military Construction	97,220	75,390	103,257	1,535,579	1,309,722	1,581,256
Family Housing	43,605	45,835	49,173	558,235	130,266	114,964
Civil Defense	7,108	6,062	12,204	100,058	77,877	91,893
Other—Special Foreign Currency Program	—	*	11	11	—	2,193
Revolving and Management Funds [a]	161,233	-115,478	-593,316	512,023	658,208	527,834
Subtotal—Military Functions	6,056,846	5,841,473	5,753,353	67,664,401	32,130,313	36,447,172
Military Assistance	60,136	92,983	209,287	872,644	1,816,161	2,112,357
TOTAL—DEPARTMENT OF DEFENSE	6,116,982	5,934,456	5,962,640	68,537,045	33,946,474	38,559,529

[a] Includes In-Transit Stock Fund charges not reflected in Service amounts.

NOTE: Detail may not add to rounded totals.

Department of the Army

	Expenditures				Unpaid Obligations	
	April 1967	May 1967	June 1967	Cum thru June 30, 1967	At start of year	As of June 30, 1967
Military Personnel						
Active forces	583,285	573,461	779,371	6,696,371	320,524	392,872
Reserve forces	44,377	55,195	74,868	603,835	114,434	112,152
Undistributed	37,810	-8,077	-33,105	—	—	—
Total—Military Personnel	665,472	620,579	821,134	7,300,206	434,958	505,024
Operation and Maintenance	664,477	724,749	929,014	7,293,385	881,122	1,252,029
Procurement						
Aircraft	108,639	76,045	99,741	961,576	1,137,653	1,303,735
Missiles	37,098	23,903	-14,373	220,627	537,097	458,264
Tracked combat vehicles	31,914	47,721	34,062	264,826	432,565	611,133
Ordnance, vehicles, and related equipment	216,810	181,685	-101,077	1,780,281	3,421,137	3,387,912
Electronics and communications	58,200	41,702	77,682	476,830	738,404	780,554
Other procurement	75,358	58,361	103,606	637,390	666,038	817,300
Undistributed	-58,114	-55,373	-135,310	48,425	-337,631	-386,056
Total—Procurement	469,903	374,043	64,332	4,389,955	6,595,263	6,972,842
Research, Development, Test, and Evaluation						
Military sciences	15,876	11,215	23,699	165,565	120,589	133,665
Aircraft	10,565	9,860	8,274	120,456	92,925	85,463
Missiles	61,357	48,266	97,776	752,325	461,337	435,876
Astronautics	2,473	1,265	1,437	22,008	20,741	15,069
Ordnance, vehicles, and related equipment	19,793	12,686	12,459	179,734	139,922	136,432
Other equipment	26,316	25,065	29,802	267,311	197,438	218,437
Program-wide management and support	3,235	5,231	7,412	78,362	31,310	39,835
Undistributed	-10,443	14,219	-62,240	48,189	-145,833	-194,032
Total—Research, Development, Test, & Evaluation	129,171	127,808	118,619	1,633,950	918,429	870,745
Military Construction	178,599	26,141	18,057	447,850	518,995	818,076
Revolving and Management Funds	5,529	-74,091	204,610	-55,082	40,077	58,732
TOTAL—DEPARTMENT OF THE ARMY	2,113,153	1,799,229	2,155,766	21,010,265	9,388,844	10,477,449

Department of the Navy

	Expenditures				Unpaid Obligations	
	April 1967	May 1967	June 1967	Cum thru June 30, 1967	At start of year	As of June 30, 1967
Military Personnel						
Active forces	492,376	382,352	512,083	5,082,840	141,289	232,405
Reserve forces	12,428	12,562	14,098	149,515	20,898	19,698
Undistributed	-4,573	-6,980	1,593	—	—	—
Total—Military Personnel	500,231	387,934	527,774	5,232,355	162,187	252,103
Operation and Maintenance	449,558	442,056	428,294	5,058,303	1,230,060	1,197,396
Procurement						
Aircraft	209,975	218,979	234,270	2,606,578	2,818,833	3,542,971
Missiles	22,911	55,587	35,166	431,702	560,035	470,557
Ships	139,200	142,697	147,165	1,398,402	2,867,571	3,049,781
Tracked combat vehicles	985	1,296	474	8,768	16,445	21,547
Ordnance, vehicles, and related equipment	105,432	117,002	224,924	1,099,990	1,418,223	1,611,746
Electronics and communications	27,824	41,978	50,527	413,784	589,237	656,377
Other procurement	54,082	45,523	59,460	525,611	726,357	921,116
Undistributed	-3,609	-5,252	-8,568	—	—	—
Total—Procurement	556,799	617,809	743,420	6,484,835	8,996,701	10,274,095
Research, Development, Test, and Evaluation						
Military sciences	11,586	12,600	11,520	184,366	137,459	127,323
Aircraft	14,488	26,705	20,086	242,041	159,020	260,838
Missiles	47,400	91,995	56,222	710,900	249,864	293,783
Astronautics	2,365	2,111	1,708	23,020	15,876	12,677
Ships	20,796	19,142	18,999	296,285	204,792	212,773
Ordnance, vehicles, and related equipment	13,067	14,131	14,070	163,372	97,150	99,010
Other equipment	7,753	7,089	7,158	80,918	61,511	89,328
Program-wide management and support	3,497	4,371	11,190	90,199	88,594	97,989
Undistributed	3,385	1,101	-4,256	—	—	—
Total—Research, Development, Test, & Evaluation	124,336	179,245	136,697	1,791,101	1,014,266	1,193,721
Military Construction	-227,382	38,736	14,082	522,638	323,771	269,300
Revolving and Management Funds	106,395	-20,178	24,384	202,264	617,445	462,849
TOTAL—DEPARTMENT OF THE NAVY	1,509,937	1,645,603	1,874,651	19,291,496	12,344,431	13,649,465

Department of the Air Force

	Expenditures				Unpaid Obligations	
	April 1967	May 1967	June 1967	Cum thru June 30, 1967	At start of year	As of June 30, 1967
Military Personnel						
Active forces	444,034	407,993	464,799	5,274,973	127,796	224,799
Reserve forces	15,749	8,714	13,608	148,953	21,465	18,013
Undistributed	171	-1,695	424	—	—	—
Total—Military Personnel	459,954	415,012	478,831	5,423,926	149,261	242,812
Operation and Maintenance	444,653	501,437	551,792	5,714,461	805,314	955,856
Procurement						
Aircraft	407,732	471,503	322,911	4,842,449	3,552,182	4,508,567
Missiles	112,618	102,746	142,321	1,278,051	985,895	1,000,194
Ordnance, vehicles & related equipment	92,447	186,558	304,266	1,095,400	1,269,060	1,719,842
Electronics and communications	32,645	25,364	30,174	384,696	519,055	555,915
Other procurement	96,628	75,068	41,159	495,765	153,725	164,740
Undistributed	10,841	-5,583	-5,027	—	—	—
Total—Procurement	752,910	855,657	835,804	8,096,361	6,479,917	7,949,258
Research, Development, Test, and Evaluation						
Military sciences	13,625	15,635	11,269	154,310	131,634	131,619
Aircraft	45,805	42,408	39,632	668,938	287,333	449,824
Missiles	69,313	88,593	77,879	913,803	386,017	366,248
Astronautics	68,550	87,046	104,093	934,677	562,929	622,047
Other equipment	23,981	31,890	24,224	309,783	221,215	233,992
Program-wide management and support	18,793	17,414	18,081	247,681	34,752	25,214
Undistributed	15,050	3,226	-19,091	—	—	—
Total—Research, Development, Test, & Evaluation	255,117	286,210	256,089	3,229,192	1,623,880	1,828,944
Military Construction	145,263	9,635	69,095	550,289	442,931	473,206
Revolving and Management Funds	-183	-21,279	-49,922	-69,002	686	6,252
TOTAL—DEPARTMENT OF THE AIR FORCE	2,057,714	2,046,673	2,141,687	22,945,226	9,501,989	11,456,328

Defense Agencies/Office of the Secretary of Defense

	Expenditures				Unpaid Obligations	
	April 1967	May 1967	June 1967	Cum thru June 30, 1967	At start of year	As of June 30, 1967
Military Personnel						
Retired Pay	159,208	158,957	161,539	1,830,233	8,052	7,622
Operation and Maintenance	72,750	84,224	81,609	934,103	106,140	99,905
Procurement						
Ordnance, vehicles, and related equipment	18	215	180	1,939	1,796	2,230
Electronics and communications	560	324	97	8,955	8,438	5,330
Other procurement	2,918	1,665	4,997	29,812	36,649	44,346
Undistributed	-326	348	-40	—	—	—
Total—Procurement	3,169	2,553	5,234	40,706	46,883	51,906
Research, Development, Test, and Evaluation						
Military sciences	39,970	51,390	41,845	505,424	501,805	474,774
Military Construction	740	878	2,023	14,802	24,025	20,674
Family Housing	43,605	45,835	49,173	558,235	130,266	114,964
Other—Special Foreign Currency Program	—	*	11	11	—	2,193
Revolving and Management Funds	105,717	13,671	-55,044	433,844	—	—
TOTAL—DEFENSE AGENCIES/OSD	425,159	357,509	286,389	4,317,358	817,172	772,037

Office of Civil Defense

Civil Defense	7,108	6,062	12,204	100,058	77,877	91,893
Revolving and Management Funds	—	—	*	-1	—	—
TOTAL—OFFICE OF CIVIL DEFENSE	7,108	6,062	12,203	100,056	77,877	91,893

Military Assistance

Military Personnel	12	86	101	448	72	525
Operation and Maintenance	38,691	39,858	52,608	331,911	364,523	289,568
Procurement						
Aircraft	14,952	20,137	42,121	204,158	339,429	235,101
Missiles	-2,784	3,828	7,270	29,800	67,918	23,650
Ships	1,244	906	34,396	51,150	114,172	114,450
Ordnance, vehicles and related equipment	523	12,264	53,107	131,896	242,867	264,633
Electronics and communications	1,789	5,456	19,457	60,770	181,174	132,402
Other procurement	2,724	3,083	18,786	57,612	138,193	127,226
Total—Procurement	18,447	45,673	175,138	535,386	1,089,753	897,462
Research, Development, Test, and Evaluation	—	13,241	12,255	25,671	3,084	401
Military Construction	-14	-6,001	-11,024	19,912	151,977	171,824
Revolving Fund	1,676	-28,830	-9,562	-30,373	158,605	764,607
Undistributed	1,329	28,950	-10,227	-10,310	48,148	12,030
TOTAL—MILITARY ASSISTANCE	60,136	92,983	209,287	872,644	a/1,816,161	2,112,357

[a] Consistent with the decision to treat reservations under limitation .002 as obligations in reports commencing with FY 1967, the unpaid obligations at start of year are comprised of obligations/reservations and, thus, differ from the unpaid obligations as of June 30, 1966, as shown in the report of June 30, 1966.

Obligations

Fourth Quarter, Fiscal Year 1967

(Amounts in Thousands)

Department of Defense

	Available for obligation	Obligations				Unobligated Balance June 30, 1967
		April 1967	May 1967	June 1967	Cum thru June 30, 1967	
Military Personnel						
Active forces	17,686,262	1,507,789	1,486,697	1,511,994	17,577,951	108,311
Reserve forces	952,869	76,414	81,752	121,409	919,934	32,935
Retired pay	1,839,000	158,430	160,226	161,622	1,831,159	7,841
Total—Military Personnel	20,478,131	1,742,631	1,728,677	1,795,026	20,329,046	149,085
Operation and Maintenance	21,596,320	1,921,342	1,802,385	2,444,454	21,462,890	133,430
Procurement						
Aircraft	14,493,069	659,134	1,041,298	2,101,967	10,808,146	3,684,923
Missiles	2,647,946	188,217	174,400	314,443	2,060,931	587,015
Ships	5,026,364	106,446	66,647	178,901	1,714,458	3,311,906
Tracked combat vehicles	625,950	57,411	29,724	131,609	523,287	102,663
Ordnance, vehicles and related equipment	7,621,325	425,198	745,319	1,148,145	5,907,924	1,713,401
Electronics and communications	2,445,285	138,893	178,802	404,978	1,575,059	870,226
Other procurement	2,961,969	225,564	248,548	382,544	2,115,337	846,632
Undistributed	58,926	—	—	—	—	58,926
Total—Procurement	35,880,834	1,800,863	2,484,744	4,662,584	24,705,142	11,175,692
Research, Development, Test, & Evaluation						
Military sciences	1,238,879	71,464	78,829	184,301	1,050,573	188,306
Aircraft	1,520,199	60,080	105,811	204,732	1,301,974	218,225
Missiles	2,573,357	74,953	92,702	192,771	2,471,218	102,139
Astronautics	1,388,992	97,296	236,742	180,511	1,278,097	110,895
Ships	399,893	32,099	15,710	42,526	330,362	69,531
Ordnance, vehicles, and related equipment	422,035	14,985	14,928	41,553	369,263	52,772
Other equipment	940,989	57,449	67,591	127,024	763,516	177,473
Program-wide management and support	674,691	39,030	47,694	70,067	602,358	72,333
Emergency Fund	3	—	—	—	—	3
Undistributed	11,209	—	—	—	—	11,209
Total—Research, Development, Test, & Evaluation	9,170,245	447,353	660,009	1,043,486	8,167,361	1,002,884
Military Construction	3,424,799	199,253	380,313	417,269	2,143,787	1,281,012
Family Housing	729,000	49,868	40,661	61,592	550,105	178,895
Civil Defense	141,456	6,770	9,283	20,835	118,497	22,959
Other—Special Foreign Currency Program	7,348	9	—	2,195	2,204	5,144
Subtotal—Military Functions	91,428,132	6,168,089	7,106,070	10,447,442	77,479,032	13,949,100
Military Assistance	741,104	22,829	40,200	107,993	729,173	11,931
TOTAL—DEPARTMENT OF DEFENSE	92,169,236	6,190,919	7,146,270	10,555,435	78,208,205	13,961,032

Department of the Army

	Available for obligation	Obligations				Unobligated Balance June 30, 1967
		April 1967	May 1967	June 1967	Cum thru June 30, 1967	
Military Personnel						
Active forces	7,007,335	611,038	628,258	616,708	6,919,478	87,857
Reserve forces	646,899	50,493	59,818	90,532	621,398	25,501
Total—Military Personnel	7,654,234	661,529	688,077	707,240	7,540,876	113,358
Operations and Maintenance	8,405,155	781,327	831,350	979,178	8,373,484	31,672
Procurement						
Aircraft	1,433,300	27,920	100,057	370,169	1,142,129	291,171
Missiles	514,488	17,249	15,602	87,205	331,156	183,332
Tracked combat vehicles	602,260	57,747	27,920	132,379	509,417	92,843
Ordnance, vehicles and related equipment	3,871,794	299,548	288,389	790,576	3,033,911	837,883
Electronics and communications	867,830	70,523	99,131	152,772	580,577	287,253
Other procurement	1,145,889	61,230	123,014	127,186	768,018	377,871
Undistributed	26,236	—	—	—	—	—
Total—Procurement	8,461,796	534,218	654,113	1,660,287	6,365,208	2,096,588
Research, Development, Test, & Evaluation						
Military sciences	231,737	10,193	14,020	31,291	204,319	27,418
Aircraft	141,205	4,674	7,799	14,395	113,710	27,495
Missiles	789,374	14,260	28,777	56,074	747,140	42,234
Astronautics	21,002	2,558	3,454	1,410	16,710	4,292
Ordnance, vehicles and related equipment	232,009	6,400	6,994	18,700	204,030	27,979
Other equipment	408,922	30,049	32,012	56,250	312,422	96,500
Program-wide management and support	102,007	3,714	6,467	7,615	93,674	8,333
Undistributed	1,074	—	—	—	—	1,074
Total—Research, Development, Test, & Evaluation	1,927,330	71,848	99,523	185,735	1,692,005	235,325
Military Construction	1,579,368	70,031	175,135	162,051	975,294	604,074
TOTAL—DEPARTMENT OF THE ARMY	28,027,883	2,118,953	2,448,198	3,694,490	24,946,866	3,081,017

Department of the Navy

		Obligations				
	Available for obligation	April 1967	May 1967	June 1967	Cum thru June 30, 1967	Unobligated Balance June 30, 1967
Military Personnel						
Active forces	5,232,396	433,884	435,550	476,850	5,221,137	11,259
Reserve forces	150,852	12,662	12,304	16,116	150,010	842
Total—Military Personnel	5,383,248	446,546	447,854	492,967	5,371,148	12,100
Operation and Maintenance	5,803,621	610,072	414,006	780,651	5,755,379	48,242
Procurement						
Aircraft	4,793,925	291,863	338,326	920,454	3,388,539	1,405,386
Missiles	531,999	45,599	-257	83,478	354,425	177,574
Ships	5,026,364	106,446	66,647	178,901	1,714,458	3,311,906
Tracked combat vehicles	23,690	-336	1,804	-770	13,870	9,820
Ordnance, vehicles and related equipment	1,809,356	83,348	224,909	268,014	1,325,433	483,923
Electronics and communications	785,758	37,818	51,632	168,542	490,654	295,104
Other procurement	1,141,571	60,479	65,102	181,178	796,943	344,628
Undistirbuted	22,392	—	—	—	—	22,392
Total—Procurement	14,135,056	625,216	748,169	1,799,794	8,084,322	6,050,734
Research, Development, Test, and Evaluation						
Military sciences	205,862	10,170	14,186	25,326	189,078	16,784
Aircraft	444,914	32,508	61,201	96,537	343,990	100,924
Missiles	790,531	25,293	13,622	64,936	761,151	29,380
Astronautics	26,311	1,160	1,109	5,770	19,745	6,566
Ships	399,893	32,099	15,710	42,526	330,362	69,531
Ordnance, vehicles and related equipment	190,026	8,585	7,934	22,853	165,233	24,793
Other equipment	131,537	10,015	15,912	20,916	113,548	17,989
Program-wide management and support	312,527	19,546	18,855	39,845	251,533	60,994
Undistributed	24	—	—	—	—	24
Total Research, Development, Test, & Evaluation	2,501,625	139,375	148,530	318,709	2,174,640	326,985
Military Construction	959,046	55,526	85,752	142,035	575,068	383,977
TOTAL—DEPARTMENT OF THE NAVY	28,782,596	1,876,736	1,844,310	3,534,157	21,960,558	6,822,039

Department of the Air Force

	Available for obligation	Obligations				Unobligated Balance June 30, 1967
		April 1967	May 1967	June 1967	Cum thru June 30, 1967	
Military Personnel						
Active forces	5,446,531	462,867	422,889	418,436	5,437,336	9,195
Reserve forces	155,118	13,259	9,630	14,761	148,526	6,592
Total—Military Personnel	5,601,649	476,126	432,520	433,197	5,585,863	15,786
Operation and Maintenance	6,370,888	444,962	474,301	595,949	6,339,382	31,507
Procurement						
Aircraft	8,265,844	339,351	602,915	811,344	6,277,478	1,988,366
Missiles	1,601,459	125,369	159,055	143,760	1,375,350	226,109
Ships	—	—	—	—	—	—
Ordnance, vehicles and related equipment	1,936,042	42,025	231,960	89,480	1,546,182	389,860
Electronics and communications	780,100	29,244	27,307	84,972	497,981	282,119
Other Procurement	606,426	99,851	56,418	66,416	506,788	99,638
Undistributed	1,830	—	—	—	—	1,830
Total—Procurement	13,191,701	635,840	1,077,655	1,195,972	10,203,779	2,987,922
Research, Development, Test, & Evaluation						
Military sciences	196,346	12,935	10,561	20,569	176,645	19,701
Aircraft	934,080	22,898	36,811	93,800	844,274	89,806
Missiles	993,452	35,400	50,303	71,761	962,927	30,525
Astronautics	1,341,679	93,578	232,179	173,331	1,241,642	100,037
Other equipment	400,530	17,385	19,667	49,858	337,546	62,984
Program-wide management and support	260,157	15,770	22,372	22,607	257,151	3,006
Undistributed	10,111	—	—	—	—	10,111
Total—Research, Development, Test & Evaluation	4,136,354	197,963	371,894	431,929	3,820,186	316,168
Military Construction	860,771	70,234	115,895	112,330	581,974	278,797
TOTAL—DEPARTMENT OF THE AIR FORCE	30,161,363	1,825,126	2,472,265	2,769,376	26,531,183	3,630,180

Defense Agencies/Office of the Secretary of Defense

	Available for obligation	Obligations				Unobligated Balance June 30, 1967
		April 1967	May 1967	June 1967	Cum thru June 30, 1967	
Military Personnel						
Retired Pay	1,839,000	158,430	160,226	161,622	1,831,159	7,841
Operation and Maintenance	1,016,654	84,981	82,728	88,676	994,645	22,009
Procurement						
Ordnance, vehicles and related equipment	4,133	277	61	75	2,398	1,735
Electronics and communications	11,597	1,308	732	-1,308	5,847	5,750
Other procurement	68,083	4,004	4,014	7,764	43,588	24,495
Undistributed	8,468	—	—	—	—	8,468
Total—Procurement	92,281	5,589	4,807	6,531	51,833	40,448
Research, Development, Test, and Evaluation						
Military sciences	604,934	38,166	40,062	107,115	480,531	124,403
Emergency Fund	3	—	—	—	—	—
Undistributed	—	—	—	—	—	3
Total—Research, Development, Test, & Evaluation	604,937	38,166	40,062	107,115	480,531	124,406
Military Construction	25,613	3,461	3,531	853	11,451	14,163
Family Housing	729,000	49,868	40,661	61,592	550,105	178,895
Other—Special Foreign Currency Program	7,348	9	—	2,195	2,204	5,144
TOTAL—DEFENSE AGENCIES/OSD	4,314,834	340,504	332,015	428,584	3,921,928	392,905

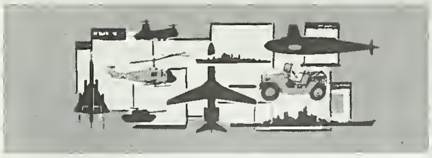
Office of Civil Defense

Civil Defense	141,456	6,770	9,283	20,835	118,497	22,959

Military Assistance

Military Personnel	325	-17	-7	14	325	—
Operation and Maintenance	314,696	28,211	18,837	41,949	302,765	11,931
Procurement						
Aircraft	99,830	-8,299	-3,757	22,676	99,830	—
Missiles	-14,470	-9,217	-1,953	-5,006	-14,470	—
Ships	51,429	3,061	-82	13,212	51,429	—
Ordnance, vehicles and related equipment	147,663	2,474	3,691	17,513	147,663	—
Electronics and communications	11,995	208	4,665	722	11,995	—
Other procurement	46,658	1,090	9,540	8,569	46,658	—
TOTAL—PROCUREMENT	343,105	-10,682	12,102	57,688	343,105	—
Research, Development, Test and Evaluation	-1,394	—	—	-73	-1,394	—
Military Construction	84,408	5,318	9,605	8,085	84,408	—
Undistributed	-36	—	-336	329	-36	—
TOTAL—MILITARY ASSISTANCE	741,104	22,829	40,200	107,993	729,173	11,931

NOTE: Commencing with reports in FY 1967, reservations under limitation .002 of the Military Assistance Program are being treated as obligations.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of October 1967:

DEFENSE SUPPLY AGENCY

2—**Texaco, Inc.**, New York, N.Y. $3,324,240. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va.

—**Metropolitan Petroleum Co.**, New York, N.Y. $1,482,891. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va.

3—**Humble Oil & Refining Co.**, Houston, Tex. $2,421,720. 16,800,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va.

—**Honeywell, Inc.**, Wellesley Hills, Mass. $1,026,597. Rental renewal of 34 line items of automatic data processing equipment now installed at the Defense Construction Supply Center, Columbus, Ohio.

4—**General Aniline & Film Corp.**, New York, N.Y. $2,479,966. 124,744 packages of radiographic film. Defense Personnel Support Center, Philadelphia, Pa.

—**Hoosier Tarpaulin & Canvas Goods Co.**, Indianapolis, Ind. $1,102,409. 10,984 tent sections with covers. Defense Personnel Support Center, Philadelphia, Pa.

—**RCA**, Washington, D.C. $1,297,366. 45 items of electronic data processing equipment. Defense Electronic Supply Center, Dayton, Ohio.

—**IBM**, Dayton, Ohio. $1,408,833. 12 items of electronic data processing equipment. Defense Electronic Supply Center, Dayton, Ohio.

5—**Montgomery Pipe & Tube Co.**, Miami, Fla. $1,408,450. 170,000 coils of concertina barbed wire. Defense Construction Supply Center, Columbus, Ohio.

10—**Pettibone-Mulliken Corp.**, Washington, D.C. $4,163,714. 240 diesel fork lift trucks. Defense General Supply Center, Richmond, Va.

—**Max Waller Co.**, Baltimore, Md. $1,094,440. Fuel oil. Defense Fuel Supply Center, Alexandria, Va.

—**Gulf Oil Corp.**, Houston, Tex. $3,605,891. Fuel oil and gasoline. Defense Fuel Suply Center, Alexandria, Va.

—**Humble Oil & Refining Co.**, Houston, Tex. $1,427,517. 315 barrels of combat, Type I, gasoline. Defense Fuel Supply Center, Alexandria, Va.

11—**Otis Elevator Co.**, Cleveland, Ohio. $1,476,850. 220 electric fork lift trucks, Defense General Supply Center, Richmond, Va.

13—**Kaiser Steel**, El Monte, Calif. $2,331,258. 2,686,090 72-inch fence posts. $1,017,157. 2,450,980 32-inch fence posts. Defense Construction Supply Center, Columbus, Ohio.

—**Republic Steel**, Chicago, Ill. $1,914,000. 200,000 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio.

—**American Tent Co.**, Canton, Miss. $3,579,550. 19,138 general purpose medium tents with covers. Defense Personnel Support Center, Philadelphia, Pa.

—**Burlington Industries**, New York, N.Y. $2,149,784. 1,820,000 linear yards of wind resistant and water repellent sateen. Defense Personnel Support Center, Philadelphia, Pa.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting agency.

—**Reigel Textile Corp.**, New York, N.Y. $1,004,322. 775,000 linear yards of wind resistant and water repellant sateen. Defense Personnel Support Center, Philadelphia, Pa.

18—**U.S. Bronze Powders, Inc.**, Flemington, N.J. $1,479,259. 4,700,000 lbs. of atomized aluminum powder. Defense General Supply Center, Richmond, Va.

—**Reynolds Metals Co.**, Richmond, Va. $2,630,250. 8,350,000 lbs. of atomized aluminum powder. Defense General Supply Center, Richmond, Va.

—**Aluminum Co. of America**, Pittsburgh, Pa. $18,275,019. 56,276,000 lbs. of atomized aluminum powder. Defense General Supply Center, Richmond, Va.

19—**Magline, Inc.**, Pinconning, Mich. $9,593,567. 24,656 tent frame sections. Defense Personnel Support Center, Philadelphia, Pa.

—**B. G. Colton & Co.**, New York, N.Y. $2,006,250. 1,500,000 linear yards of wind-resistant sateen cotton nylon cloth. Defense Personnel Support Center, Philadelphia, Pa.

23—**Etowah Industries**, Etowah, Tenn. $1,036,000. 400,000 men's cotton wind-resistant coats. Defense Personnel Support Center, Philadelphia, Pa.

—**Barstow Sportswear**, Cartersville, Ga. $1,536,000. 600,000 men's cotton wind-resistant coats. Defense Personnel Support Center, Philadelphia, Pa.

—**Richard Wynn Enterprises**, Knoxville, Tenn. $1,370,000. 500,000 men's cotton wind-resistant coats. Defense Personnel Support Center, Philadelphia, Pa.

24—**U.S. Metal Container Co.**, Miami, Okla. $1,119,650. 320,000 military gasoline cans. Defense General Supply Center, Richmond, Va.

25—**Prestex, Inc.**, New York, N.Y. $1,525,050. 2,000,000 yards of duck, cotton-warp and rayon filling cloth. Defense Personnel Support Center Philadelphia, Pa.

—**Saddler Textiles, Inc.**, New York, N.Y. $1,212,084. 972,000 linear yards of wind-resistant, sateen cotton cloth. Defense Personnel Support Center, Philadelphia, Pa.

31—The Defense General Supply Center, Richmond, Va., has awarded the following contracts for polypropylene sand bags:
Cavalier Bag Co., Lumberton, N.C. $4,933,813. 24,500,000 sand bags.
Bemis Co., Minneapolis, Minn. $1,104,926. 5,500,000 sand bags.
Continental Bag Co., Crowley, La. $1,671,931. 8,100,00 sand bags.

DEPARTMENT OF THE ARMY

2—**Robert L. Guyler**, Lampasas, Tex. $1,478,169. Construction work on expansion of a hospital at Fort Gordon, Ga. Engineer Dist., Savannah, Ga.

—**James Julian, Inc.**, Wilmington, Del. $1,320,066. Construction work on the Aylesworth Creek, Dam and Reservoir Project, Lackawanna County, Pa. Engineer Dist., Baltimore, Md.

—**Ford Motors**, Dearborn, Mich. $1,250,000. Production engineering services for 5-ton trucks. Tank Automotive Command, Warren, Mich.

—**Firestone Tire & Rubber Co.**, Akron, Ohio. $7,705,525. Track shoes for M60 tanks. Noblesville, Ind. Tank Automotive Command, Warren, Mich.

—**Eltra Corp.**, Toledo, Ohio. $1,120,593. Generators for ¼, ¾ and 2½-ton trucks. Tank Automotive Command, Warren, Mich.

—**United Aircraft**, Stratford, Conn. $3,760,000. Components and crew armor kits for CH-54A helicopters. $1,320,000. 30 sets of engine air particle separators for CH-54A helicopters. Aviation Material Command, St. Louis, Mo.

—**Bell Helicopter Co.**, Fort Worth, Tex. $1,895,600. UH-1 helicopters. Aviation Material Command, St. Louis, Mo.

—**McDonnell-Douglas Corp.**, Titusville, Fla. $5,500,000. Four months of advanced production engineering effort and engineering services with first and second year Dragon missile system production to be included when contract is definitized. St. Louis, Mo. and Titusville. Army Missile Command, Huntsville, Ala.

3—**General Motors**, Cleveland, Ohio. $3,345,000. Continuation of production engineering services for M551 vehicles. Army Weapons Command, Rock Island, Ill.

—**Joseph L. Pohl Contractors**, Nevada, Mo. $1,454,400. Construction work on the Chariton River Levees. Near Glasgow, Mo. Engineer Dist., Kansas City, Mo.

4—**Martin-Johnson Inc.**, Pensacola, Fla. $1,$063,247. Construction of a jet engine test cell at Elgin AFB, Fla. Engineer Dist., Mobile, Ala.

5—**Electro-Mechanics, Inc.**, New Britain, Conn. $1,464,820. Cable assemblies for 250 and 500 lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Peter Kiewit Sons' Co.**, Milmont Park, Milmont Park, Pa. $1,750,600. Repair of locks on the St. Lawrence Seaway. Messena, N.Y. Engineer Dist., Buffalo, N.Y.

6—**Vitro Corp. of America**, Fort Walton Beach, Fla. $1,166,914. Design, development, fabrication, installation and testing of three fixed and two mobile telemetry acquisition systems for the system test facility range at the Army Electronics Proving Ground. Procurement Div., Fort Huachuca, Ariz.

—**Uniroyal, Inc.**, Mishawaka, Ind. $1,168,352. Fuel tanks for UH-1 helicopters. Aviation Material Command, St. Louis, Mo.

—**Hechethorn Mfg. Co.**, Dyersburg, Tenn. $1,106,389. Metal parts for hand grenades. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Electric**, Burlington, Vt. $10,270,182. Maintenance spare parts for the 7.62mm aircraft machine gun and pod. Army Weapons Command, Rock Island, Ill.

—**Lear Siegler, Inc.**, Anaheim, Calif. $3,500,000. Electronics equipment. Electronics Command, Fort Monmouth, N.J.

—**Philco Corp.**, Philadelphia Pa. $1,749,049. Secure voice access system and ancilliary items. Electronics Command, Fort Monmouth, N.J.

—**Page Communications Engineers**, Washington, D.C. $4,797,053. Maintenance and operation services in connection with Integrated Wide Band Communications Systems in Southeast Asia. Electronics Command, Fort Monmouth, N.J.

9—**Rulon Co.**, Chicago, Ill. $2,150,000. Metal parts for fuzes for field artillery weapons. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Robert Simmons Construction Co.**, Louisville, Ky. $2,092,678. Construction of six tank repair shops and four automotive repair shops at Fort Knox, Ky. Engineer Dist., Louisville, Ky.

11—**Westinghouse Electric**, Washington, D.C. $1,060,000. Transportable generator sets. Buffalo, N.Y. Research and Development Laboratories, Fort Belvoir, Va.

—**Flinchbaugh Products**, Red Lion, Pa. $1,009,400. Metal parts for 90mm projectiles. Ammunition Procurement & Supply Agency, Joilet, Ill.

13—**Hercules, Inc.** Wilmington, Del. $53,050,027. Manufacture of miscellaneous propellants and operations and maintenance activities. Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Hughes Tool Co.**, Culver City, Calif. $2,153,159. Crew and component armor kits for OH-6A helicopters. Aviation Material Command, St. Louis, Mo.

—**Philco Ford Corp.**, Newport Beach, Calif. $1,800,000. Chapparral guided missile components. Anaheim, Calif. Army Missile Command, Huntsville, Ala.

—**Hercules, Inc.**, Wilmington, Del. $1,190,865. Miscellaneous propellants and mixed acids. Lawrence, Kan. Ammunition Procurement & Supply Agency, Joilet, Ill.

17—**Applied Devices Corp.**, College Point, N.Y. $1,379,085. Hawk simulator trainers. Army Missile Command, Huntsville, Ala.

—**Honeywell, Inc.**, Hopkins, Minn. $2,566,455. Grenade fuzes. St. Louis Park, Minn. Ammunition Proceurment & Supply Agency, Joliet, Ill.

—**Bell Helicopter**, Fort Worth, Tex. .$2,597,018. Rotary rudder blades for UH-1 helicopters. Aviation Material Command, St. Louis, Mo.

—**Carey-Waterbury Co. and North American Dye Corp.**, Danbury, Conn. $1,131,016. Colored smoke dye. Army Arsenal, Edgewood, Md.

—**Norris Industries**, Everett, Mass. $10,890,356. 66mm rocket launchers. Brockton, Mass. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**International Harvester Co.**, Chicago, Ill. $1,851,016. Cargo trucks. Springfiled, Ill.; Minneapolis, Minn. and Milwaukee, Wis. Tank Automotive Command, Warren, Mich.

18—**United Aircraft**, Stratford, Conn. $5,000,000. Long lead time materials and components for CH-54A helicopters. Aviation Material Command, St. Louis, Mo.

—**Hollingsworth Co.**, Phoenixville, Pa. $2,190,325. Three KW generators (AC). $1,783,458. Three KW generator sets (DC). Aviation Material Command, St. Louis, Mo.

—**Federal Cartridge Corp.**, Anoka, Minn. $3,476,935. 5.56mm ball cartridges in 10-round clips. Frankford Arsenal, Philadelphia, Pa.

—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $2,203,600. Ten-round clips of 5.56mm ball cartridges. Courcelette, Quebec, Canada. Frankford Arsenal, Philadelphia, Pa.

19—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $1,147,945. 3,563,300 lbs. of nitroguanadine. Niagra Falls, Canada. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**DeMauro Construction Corp.**, Carson City, Nev. $1,621,288. Construction of 23 miles of raw water mains, including necessary valves and replacement of pavement. Ufu and Taiho, Okinawa. Engineer Dist., Okinawa.

—**Bell Helicopter Co.**, Fort Worth, Tex. $1,848,509. Gear box assemblies for UH-1 helicopters. Aviation Material Command, St. Louis, Mo.

—**Air Logistics Corp.**, Pasadena, Calif. $1,239,064. 392 sets of assault trackway and applicable parts kits for helicopter landings. Mobility Equipment Command, St. Louis, Mo.

20—**Beech Aircraft**, Wichita, Kan. $1,329,704. U-21A aircraft and related data. Aviation Material Command, St. Louis, Mo.

—**RCA**, Moorestown, N.J. $3,995,000. System study to determine and identify the detailed system and subsystem design of the Mallard Communication System. Electronics Command, Fort Monmouth, N.J.

—**Sylvania Electric Products**, Waltham, Mass. $3,500,000. System study to determine and identify the detailed system and sub-system design of the Mallard Communications System. Electronics Command, Fort Monmouth, N.J.

23—**Mason & Hanger—Silas Mason Co.**, New York, N.Y. $26,611,283. Loading, assembling and packing artillery projectiles, mines and related components. Burlington, Iowa. $2,792,125. Loading, assembling and packing large caliber ammunition, mines and bombs. Grand Island, Neb. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Hayes International Corp.**, Birmingham, Ala. $2,460,800. Metal parts for 2.75-inch rocket warheads. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**KDI Corp.**, Cincinnati, Ohio. $2,336,480. Metal parts for 2.75-inch rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Hayes Albion Corp.**, Albion, Mich. $2,041,600. Metal parts for 2.75-inch rocket warheads. Hillsdale and Albion, Mich. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Time Corp.**, LaSalle, Ill. $2,020,200. Metal parts for 2.75-inch rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Weatherhead Co.**, Cleveland, Ohio. $1,869-562. Metal parts for 105mm HEAT projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Airport Machining Corp.**, Martin, Tenn. $1,420,800. Metal parts for 2.75-inch rocket warheads. Union City, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Southwest Truck Body Co.**, St. Louis. Mo. $5,742,514. Semi-trailer mounted general purpose repair shop equipment. West Plains, Mo. Mobility Equipment Command, St. Louis, Mo.

—**Sylvania Electric Products, Inc.**, Mountain View, Calif. $4,172,756. Classified research and development. Santa Cruz and Mountain View, Calif. Research and Development Laboratories, Fort Belvoir, Va.

—**Teledyne Industries**, Garland, Tex. $1,587,000. Low frequency amplifiers. Research and Development Laboratories, Fort Belvoir, Va.

—**Motorola, Inc.**, Scottsdale, Ariz. $1,555,372. Surveillance sets. Electronics Command, Fort Monmouth, N.J.

24—**Crest Construction Corp.**, Norfolk, Va. $3,582,654. Construction of an academic building at the the Army Logistics Management Center, Fort Lee, Va. Engineer Dist., Norfolk, Va.

—**Kaiser Steel**, El Monte Calif. $2,522,000. M2A1 ammunition boxes. Burbank, Calif. Frankford Arsenal, Philadelphia, Pa.

—**ESB, Inc.**, Raleigh, N.C. $1,953,153. Primary wet batteries for the Nike Hercules missile. Electronics Command, Philadelphia, Pa.

—**Standard Container Co.**, Montclair, N.J. $1,865,500. M2A1 ammunition boxes. Homerville, Ga. Frankford Arsenal, Philadelphia, Pa.

—**Bulova Watch Co.**, Jackson Heights, N.Y. $1,609,650. Metal parts for 2.75-inch rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Sperry Rand**, St. Paul Minn. $1,500,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.

25—**Galion Amco, Inc.**, Galion, Ohio. $3,517,200. 20mm cartridge fuzes. Frankford Arsenal, Philadelphia, Pa.

—**Supreme Products**, Chicago, Ill. $2,747,900. 20mm cartridge fuzes. Frankford Arsenal, Philadelphia, Pa.

—**Waltham Precision Instruments**, Waltham, Mass. $1,583,818. 20mm cartridge fuzes. Frankford Arsenal, Philadelphia, Pa.

—**Zeller Corp.**, Defiance, Ohio. $1,047,900. 20mm cartridge fuzes. Frankford Arsenal, Philadelphia, Pa.

—**Dorsey Trailers**, Elba, Ala. $3,038,665. Semi-trailers. Tank Automotive Command, Warren, Mich.

—**Theurer, Inc.**, Newark, N.J. $2,794,122. M750 semi-trailers. Tank Automotive Command, Warren, Mich.

—**United Ammunition Container Corp.**, Philadelphia, Pa. $2,223,840. M105A2 ammunition containers. Atlanta, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Olin Mathieson Chemical Corp.**, East Alton, Ill. $2,107,970. MK 52 auxiliary detonating fuzes for major caliber projectiles. Marion and East Alton, Ill. Harry Diamond Laboratories, Washington, D.C.

—**Peter Kiewit Sons, Inc.**, Milmont Park, Pa. $1,655,971. Culvert crack repair of lock at Massena, N.Y. Engineer Dist., Buffalo, N.Y.

—**Cabot Corp.**, Pampa, Tex. $1,251,192. Tube forgings for the 152mm M81 gun and the 152mm XM162 gun. Kings Mill, Tex. Army Arsenal, Watervliet, N.Y.

27—**American Machine & Foundry Co.**, Brooklyn, N.Y. $12,728,624. Metal parts for 750-lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Levinson Steel Co.**, Pittsburgh, Pa. $6,604,500. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Donovan Construction Co.**, New Brighton, Minn. $6,400,000. Metals parts for 155mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Motors**, Detroit, Mich. $3,280,488. Diesel engines for armored personnel carriers. Tank Automotive Command, Warren, Mich.

—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $2,550,000. Tracked vehicles. Montreal, Quebec Canada. Tank Automotive Command, Warren, Mich.

—**Firestone Tire & Rubber Co.**, Akron, Ohio. $1,712,776. Pneumatic tires for earth movers. Des Moines, Iowa and Bloomington, Ill. Tank Automotive Command, Warren, Mich.

—**Remington Arms Co.**, Bridgeport, Conn. $5,122,089. Ten-round clips of 5.56mm ball cartridges. Frankford Arsenal, Philadelphia, Pa.

—**Philco-Ford Corp.**, Newport Beach, Calif. $1,451,200. Guided missile system test sets. Army Missile Command, Huntsville, Ala.

—**RCA**, Camden, N.J. $1,826,206. Panoramic telescopes for 175mm and 8-inch howitzers. Frankford Arsenal, Philadelphia, Pa.

—**Maremount Corp.**, Saco, Maine. $1,648,626. M60 machine guns, spare barrels and bipod assemblies. Rock Island Arsenal, Ill.

—**Western Electric**, New York, N.Y. $1,295,800. Dual display console kits for modification of the Nike Hercules missile system. Burlington, N.C. Army Missile Command, Huntsville, Ala.

30—**Cessna Aircraft**, Wichita, Kan. $5,453,214. Bomb dispensers. Procurement Detachment, Chicago, Ill.

—**General Electric**, Burlington, Vt. $2,540,000. 20mm air defense artillery guns. Procurement Detachment, New York, N.Y.

—**Southwest Truck Body Co.**, St. Louis, Mo. $1,682,840. Semi-trailer mounted shop sets. West Plains, Mo. Mobility Equipment Command, St. Louis, Mo.

—**Bermite Powder Co.**, Saugus, Calif. $1,468,200. Auxiliary detonating fuzes for major caliber projectiles. Harry Diamond, Laboratories, Washington, D.C.

31—**Olin Mathieson Chemical Corp.**, New Haven, Conn. $18,606,540. Ammunition. $1,126,510. Amunition. Frankford Arsenal, Philadelphia, Pa.

—**Olin Mathieson Chemical Corp.**, East Alton, Ill. $14,816,053. Ammunition. $3,980,088. Ammunition. Frankford Arsenal, Philadelphia, Pa.

—**Remington Arms**, Bridgeport, Conn. $13,613,250. Ammunition and ammunition cartons. $1,598,628. Ammunition. Frankford Arsenal, Philadelphia, Pa.

—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $7,158,800. Ammunition. Courcelette, Quebec, Canada. Frankford Arsenal, Philadelphia, Pa.

—**Amron Corp.**, Waukesha, Wis. $5,976,000. Metal part for 20mm projectiles. Frankford Arsenal, Philadelphia, Pa.

—**Zeller Corp.**, Defiance, Ohio. $3,985,930. Metal parts for 20mm projectiles. Frankford Arsenal, Philadelphia, Pa.

—**National Pesto Industries**, Eau Claire, Wis. $7,000,000. Eight-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Kennedy Van Saun Corp.**, Danville, Pa. $3,007,620. Metal parts for 4.2-inch projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Parson Mfg. & Stamping Co.**, Cordova, Tenn. $2,381,491. 4.2-inch projectile parts. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**AVCO Corp.**, Richmond, Ind. $1,487,427. Metal parts for 40mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Penland Paper Converting Corp.**, Hanover Pa. $1,254,600. 105mm ammunition containers. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**M. C. Riccardi Co.**, Alpha, N.J. $1,249,500. Fiber ammunition containers. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $8,541,400. Vehicular mounted radio relay sets. Electronics Command, Fort Monmouth, N.J.

—**International Telephone & Telegraph Corp.**, Easton, Pa. $4,000,000. Assembly of 25mm image intensifiers. Roanoke, Va. Electronics Command, Fort Monmouth, N.J.

—**Varo, Inc.**, Garland, Tex. $4,000,000. Assembly of 25mm image intensifiers. Electronics Command, Fort Monmouth, N.J.

—**Raython Co.**, **Norwood**, Mass. $3,811,150. Multiplexers. Electronics Command, Fort Monmouth, N.J.

—**Sylvania Electronic Products**, Mountain View, Calif. $1,615,000. Research & development for 12 months in the field of Electronics. Electronics Command, Fort Monmouth, N.J.

—**Consolidated Box, Inc.**, Tampa Fla. $2,313,600. Fiber ammunition containers. Procurement Detachment, New York, N.Y.

—**Eastern Tool & Mfg. Co.**, Belleville, N.J. $1,824,320. Metal parts for 40mm projectiles. Procurement Detachment, New York, N.Y.

—**Eisen Bros., Inc.**, Hoboken, N.J. $1,740,182. Metal parts for 40mm projectiles. Procurement Detachment, New York, N.Y.

—**R. C. Can Co.**, Hazelwood, Mo. $1,377,600. Fiber ammunition containers. Procurement Detachment, New York, N.Y.

—**Electro Mechanical Corp.**, Sayre, Pa. $2,115,099. Electrical equipment shelters. Electronics Command, Philadelphia, Pa.

—**LTV Electrosystems, Inc.** Huntington, Ind. $1,414,810. Radio receivers and transmitters. Electronics Command, Philadelphia Pa.

—**Mack Trucks**, Allentown, Pa. $6,500,000. Ten-ton tractor trucks. Tank Automotive Command, Warren, Mich.

—**Kaiser Jeep Corp.**, Toledo, Ohio. $1,483,218. ¼-ton utility trucks. Tank Automotive Command, Warren, Mich.

—**Martin Marietta**, Orlando, Fla. $10,351,000. Continued industrial engineering services in support of the Pershing missile system. Army Missile Command, Huntsville, Ala.

—**Rohm and Hass Co.**, Philadelphia, Pa. $2,150,000. Propellant research program. Huntsville, Ala. Army Missile Command, Huntsville, Ala.

—**Stanford Research Institute**, Menlo Park, Calif. $1,941,953. Classified research. Army Research Office, Durham, N.C.

—**Brown Engineering Co.**, Huntsville, Ala. $1,137,027. An interim data system program. Nike-X Project Office, Army Missile Command, Huntsville, Ala.

DEPARTMENT OF THE NAVY

2—**United Aircraft**, Stratford, Conn. $5,300,000. HH-53C helicopters for the Air Force. Naval Air Systems Command.

3—**Westinghouse Electric**, Pittsburgh, Pa. $32,046,453. Design and furnish nuclear propulsion components. Naval Ship Systems Command.

—**Lockheed Aircraft**, Burbank, Calif. $28,230,000. P3C aircraft. Naval Air Systems Command.

—**Johns Hopkins University**, Silver Spring, Md. $5,783,000. Research and development for the Talos missile. Naval Ordnance Systems Command.

—**General Dynamics**, Pomona, Calif. $1,300,000. Airborne avionics equipment for the Standard Arm Missile. Naval Air Systems Command.

—**Curtis Wright Corp.**, Wood-Ridge, N.J. $3,875,551. Repair parts in support of various aircraft engines. Aviation Supply Office, Philadelphia, Pa.

—**Westinghouse Electric**, Baltimore, Md. $3,000,000. Production of repair parts and support material for technical evaluation of MK 48 torpedoes, MK 47 mobile targets and associated equipment. Naval Ordnance Systems Command.

—**Texas Instruments**, Dallas, Tex. $1,520,657. Design, development and fabrication of a sonar data acquisition system for submarines. Navy Purchasing Office, Los Angeles, Calif.

—**Pieretti Construction Co.**, Essex, Conn. $1,136,000. Construction of enlisted men's barracks at the Naval Submarine Base, New London, Conn. Naval Facilities Engineering Command.

—**AVCO Corp.**, Richmond, Va. $2,031,606. Design, development, fabrication and test of arming and fuzing systems. Naval Ordnance Laboratory, Silver Spring, Md.

4—**International Telephone & Telegraph**, Paramus, N.J. $2,933,848. Programming services for the Fleet Computer Programing Center, Atlantic, tactical data system. Virginia Beach, Va. Navy Purchasing Office, Washington, D.C.

—**Sperry Rand**, Great Neck, N.Y. $3,314,770. Prototype models of the Phase II Integrated Light Attack Aviations System. Naval Air Systems Command.

5—**United Aircraft**, East Hartford, Conn. $3,968,538. A-4E and A-6A aircraft engine spare parts. Aviation Supply Office, Philadelphia, Pa.

—**Maxson Electronics Corp.**, Macon, Ga. $2,893,500. MK 54 auxiliary detonating fuzes for five-inch 38 cal. projectiles. Navy Ships Parts Control Center, Mechanicsburg, Pa.

6—**General Dynamics**, Pomona, Calif. $24,797,640. FY 1968 funding for production of medium range Standard missile and extended range Standard missile. Naval Ordance Systems Command.

—**North American Aviation**, Columbus, Ohio. $10,000,000. Support of planned procurement of RA-5C weapon system. Naval Air Systems Command.

—**Bendix Corp.**, Mishawaka, Ind. $4,525,000. Modification of Type II and Type III Talos missile arm configuration. Naval Ordnance Systems Command.

—**Sperry Rand Corp.**, Great Neck, N.Y. $3,587,313. Incremental funding for FY 1968 production of radar sets for Terrier missiles. Naval Ordnance Systems Command.

—**Raytheon Co.**, Lexington, Mass. $2,572,000. Design, development, fabrication, assembly and testing of service model dual radar sets. Naval Ordnance Systems Command.

9—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $25,000,000. Production of Poseidon (C-3) missiles and related equipment. Special Projects Office.

—**Metals Engineering Corp.**, Greenville, Tenn. $6,717,957. Conical fin assemblies used with the MK 82, 500-lb. bomb. Navy Ships Parts Control Center, Mechanicsburg, Pa.

11—**General Dynamics**, Pomona, Calif. $2,498,784. Research and development on the Standard Arm Missile. Naval Air Systems Command.

—**Royal Industries**, Santa Ana, Calif. $3,523,899. 600-gallon external auxiliary fuel tanks. Naval Air Systems Command.

—**Collins Radio Co.**, Cedar Rapids, Iowa. $3,248,196. Radio sets. Marine Corps Headquarters.

13—**North American Rockwell Corp.**, Columbus, Ohio. $5,000.000. OV-10A aircraft. Naval Air Systems Command.

—**Bendix Corp.**, Baltimore, Md. $3,374,785. Airborne receiver transmitter sets and equipment. Naval Air Systems Command.

—**Collins Radio Co.**, Richardson, Tex. $2,924,959. Airborne communications sets and equipment. Naval Air Systems Command.

16—**LTV Aerospace Corp.**, Dallas, Tex. $30,567,850. Modification to three previously issued contracts ($24,247,800 for services and materials to extend the service life of F-8D and F-8E aircraft; $2,320,050 for long lead time effort and materials to support proposed procurement of improvement changes to extend the service life of RF-8A aircraft, and $4,000,000 to increase the limitation of authorization for long lead time effort for A-7D aircraft for the Ar Force.) Naval Air Systems Command.

17—**Oshkosh Truck Corp.**, Oshkosh, Wis. $6,066,130. 190 MB-5 aircraft rescue fire fighting trucks. Midwest Div., Naval Facilities Engineering Command, Great Lakes, Ill.

—**Kaman Corp.**, Colorado Springs, Colo. $1,096,000. Classified services. Special Projects Office.

18—**Horne Bros., Inc.**, Newport News, Va. $1,074,980. Regular overhaul of the attack cargo ship USS Yancey (AKA 93). Supervisor of Shipbuilding, Fifth Naval Dist., Newport News, Va.

19—**United Aircraft**, Hartford, Conn. $2,454,178. Spare parts to support TF30-P-8 engines on A-7B aircraft. Aviation Supply Office, Philadelphia, Pa.

—**Westinghouse Electric**, Baltimore, Md. $2,043,711. Support items for radar sets. Naval Air Systems Command.

20—**Treadwell Corp.**, New York, N.Y. $1,100,260. Repair of Government-furnished oxygen generators. Bronx, N.Y. Naval Ship Systems Command.

—**General Electric**, Washington, D.C. $1,040,937. Research and development effort for Polaris missiles. Pittsfield, Mass. Special Projects Office.

23—**American Bosch Arma Corp.**, Philadelphia, Pa. $1,851,010. Weapons control switching systems for MK 114 fire control systems and related equipment. Naval Ordnance Systems Command.

24—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $6,000,000. Construction of the Navy's second Deep Submergence Rescue Vehicle. Naval Ship Systems Command.

—**United Aircraft**, Stratford, Conn. $2,578,272. Main rotor blades for H-34 aircraft. Aviation Supply Office, Philadelphia, Pa.

—**Innovations, Inc.**, Lexington, Ohio. $2,252,110. Missile shipping and storage containers Naval Air Systems Command.

—**Collins Radio Co.**, Cedar Rapids, Iowa. $1,007,093. Airborne electronic communication navigation equipment. Naval Air Systems Command.

25—**United Aircraft**, East Hartford, Conn. $1,650,000. Spare parts for TF-30-P3, P12 engines. $1,125,000. Spare parts for TF30-P12 engines. Aviation Supply Office, Philadelphia, Pa.

—**Ocean Electric Corp.**, Norfolk, Va. $1,111,000. Installation of an electrical system at the Sewells Point Area Naval Station, Norfolk, Va. Atlantic Div., Naval Facilities Engineering Command, Norfolk, Va.

—**Hawaian Dredging & Construction Co.**, Honolulu, Hawaii. $1,040,000. Dredging coral and stockpiling it at Fort Kamebameha. Naval Supply Center, Pearl Harbor, Hawaii.

26—**General Electric**, Washington, D.C. $5,700,000. Fire control systems and guidance support enquipment for the Poseidon missile. Pittsfield, Mass. Special Projects Office.

27—**Hughes Aircraft**, Culver City, Calif. $9,000,000. Incremental funding for the Phoenix missile system. Naval Air Systems Command.

30—**Stanwick Corp.**, Washington, D.C. $2,148,558. Development and analysis of management information products in support of the Navy Maintenance and Material Management System. $1,181,830. Planning evaluations, engineering design and recommendations in support of overhaul of the attack aircraft carrier USS Franklin D. Roosevelt (CVA-42). Naval Ship Systems Command.

31—**National Steel & Shipbuilding Co.**, San Diego, Calif. $1,013,615. Topside alterations and repairs, and drydocking of the landing ship dock USS Carter Hall (LSD-3). Supervisor of Shipbuilding, Eleventh Naval Dist., San Diego, Calif.

DEPARTMENT OF THE AIR FORCE

2—**Brooks & Perkins**, Detroit, Mich. $1,571,544. Manufacture of cargo handling equipment. Warner Robins Air Material Area, (AFLC), Robins AFB, Ga.

—**Goodyear Aerospace Corp.**, Litchfield Park, Ariz. $2,568,666. Manufacture of airborne radar components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Hallicrafters**, Chicago, Ill. $1,934,350. Manufacture of counter-measure equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

3—**Goodyear Aerospace Corp.**, Lichfield Park, Ariz. $1,896,450. Development of an optical radar data correlator system. Systems Engineering Group, Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Fairchild Hiller Corp.**, St. Augustine, Fla. $1,417,934. Maintenance and reconditioning of C-119 aircraft. Warner Robins Air Material Area (AFLC), Robins AFB, Ga.

—**Litton Systems.** Woodland Hills, Calif. $3,411,485. Production of an avionics subsystem for F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Raytheon Co.**, Burlington, Mass. $1,800,000. Retrofit of radar systems. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

4—**Texas Instruments**, Dallas, Tex. $1,892,400. Components for an infrared detecting set for F-4C aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Bendix Corp.**, Teterboro, N.J. $1,180,838. Production of flight instruments for F-111 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Whittaker Corp.**, Chatsworth, Calif. $2,400,000. Manufacture of airborne electronics equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Hughes Aircraft**, Culver City, Calif. $1,114,683. Supplies and services for repair and modification of components and assemblies of an airborne fire control system. Los Angeles, Calif. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**Philco Ford Corp.**, Philadelphia, Pa. $3,207,088. Production of electronic components for Sidewinder missiles. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

5—**Fairchild Camera & Instrument Corp.**, Syosset, N.Y. $1,499,954. Stabilized camera mounts. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Hallicrafters,** Chicago, Ill. $1,072,572. Electronic tubes. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

11—**Raytheon Co.**, Waltham, Mass. $3,488,508. Modification of bomb-navigational systems on B-58 aircraft. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**Sperry Rand Corp.**, Great Neck, N.Y. $2,063,398. Modification of the bomb-navigational system on B-52 aircraft. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**General Dynamics**, San Diego, Calif. $3,102,677. Design, manufacture, integration and launch of space vehicles. Space and Missile Systems Organization, (AFSC), Norton AFB, Calif.

12—**Litton Systems**, Woodland Hills, Calif. $10,935,840. Production of avionics subsystem components for F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**United Aircraft**, Windsor Locks, Conn. $1,119,994. Overhaul and modification of Hamilton Standard propeller assemblies. East Granby, Conn. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

16—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $4,000,000. Agena launch services at Vandenberg AFB, Calif., for period Oct. 1, 1967 through Sept. 30, 1968. Space and Missile Systems Orangization, (AFSC), Los Angeles, Calif.

—**Boeing Co.**, Seattle, Wash. $4,551,735. Continuation of development study and testing programs for the Minuteman missile system. Space and Missile Systems Organization, (AFSC), Los Angeles, Calif.

17—**United Aircraft**, East Hartford, Conn. $1,224,961. Production of spare parts for J-75 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

—**North American Aviation**, Anaheim, Calif. $5,433,200. Guidance and control systems for Minuteman II missile systems. Space & Missile Systems Organization, (AFSC), Norton AFB, Calif.

18—**Hoffman Electronics Corp.**, El Monte, Calif. $4,063,940. Production of air navigation equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

19—**Bendix Corp.**, North Hollywood, Calif. $5,187,782. Production of electronic equipment for F-4E aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Cleveland Pneumatic Tool Co.**, Cleveland, Ohio. $1,156,600. Production of landing gear components for KC-130 aircraft. Ogden Air Material Area, (AFLC), Hill AFB, Utah.

20—**Magnavox Co.**, Fort Wayne, Ind. $1,835,932. Production of aircraft communications equipment. Warner Robins Air Material Area, (AFLC), Robns AFB, Ga.

—**General Dynamics**, Fort Worth, Tex. $1,246,340. Machine tool modernization program. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Itek Corp.**, Palo Alto, Calif. $2,578,160. Airborne radar equipment. Warner Robins Air Material Area, (AFLC), Robins AFB, Ga.

—**Tele-Signal Corp.**, Woodbury, N.Y. $1,151,300. Engineering and installation of Communication switching centers. Oklahoma City Air Material Area, (AFLC), Tinker AFB, Okla.

23—**North American Aviation**, Anaheim, Calif. $2,718,000. Maintenance, repair, overhaul and modification of Minuteman guidance control systems. Space & Missile Systems Organization, (AFSC), Norton AFB, Calif.

24—**Baldwin-Lima-Hamilton Electronics Corp.**, Waltham, Mass. $1,013,492. Production of a mobile electronic weighing system. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

26—**Fairchild Hiller**, Hagerstown, Md. $1,426,778. Various modifications to C-123 aircraft. Warner Robins Air Material Area, (AFLC), Robins AFB, Ga.

27—**North American Aviation**, Canoga Park, Calif. $1,650,000. Work on an advanced maneuvering propulsion system. Air Force Flight Test Center, Edwards AFB, Cailf.

—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $1,317,906. Manufacture of wheels and brakes for F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB Ohio.

—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $3,832,660. Weapons release system applicable to F-4 Aircraft. Rexdale, Ontario, Canada. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

30—**Lockheed Aircraft**, Lake Charles, La. $1,363,333. Inspection and repair of F-101 aircraft. Ogden Air Material Area, (AFLC), Hill AFB, Utah.

31—**Honeywell, Inc.**, Hopkins, Minn. $16,500,000. Manufacture of land mines and asocated equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Litton Systems**, Woodland Hills, Calif. $5,740,850. Production of avionics subsystem components for F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Electric**, West Lynn, Mass. $2,928,000. Procurement of T-64 aircraft engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

OFF-SHORE PROCUREMENT

3—**Federal Republic of Germany**, Bundesamt fuer Wehrtechnik und Beschaffung, Koblenz, Germany. $1,741,191. Spare parts for the 20mm gun. $9,621,703. 20mm automatic guns. $16,431,945. 20mm ammunition. Work on all three contracts will be performed in Dusseldorf. Army Procurement Center, Frankfurt, Germany.

—**Leonhard Leidel K. G.**, Mannheim, Germany. $1,029,160. Coal. Army Procurement Center, Frankfurt, Germany.

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FLARE

Army Uses Laser Beam To Simulate Tank Cannon Fire in Target Practice

Laser "guns" that simulate the firing of heavy tank cannons are helping the Army increase the efficiency of target practice by cutting training time as much as 20 percent while, at the same time, improving the accuracy of gunners.

Called weapon fire simulators, the lasers fire brief, brilliant beams of light along the path an actual shell would take, lighting up the spot where the target would be hit but causing no damage.

One advantage of the laser gun is that it prevents gunnery trainees from using short-cuts in adjusting their sights—methods which can't be applied in actual combat.

In conventional target practice, the gunner lines up his target in an optical sight, squeezes off a round, and checks his accuracy by glancing at the distance between the bullet hole and the intersection of his gunsight crosshairs.

Trainees, however, are inclined to take a short-cut by centering the crosshairs of the sight on the previous bullet hole—a method that is impossible to practice under battlefield conditions where a miss leaves no mark, and targets usually are in motion.

The laser simulator insures against this practice because it doesn't produce a bullet hole, only a burst of light that lasts for a fraction of a second on the target. This forces the gunner to make a quick mental note of needed correction with battlefield speed and techniques.

Success in tank weapon simulation with lasers has led other training areas within the military to consider similar equipment for artillery and anti-personnel weapons simulation. In the simulation of automatic weapons, lasers could effect sizeable ammunition savings, since cost per shot is about one-tenth of a cent.

The Army now lists the laser gun device as part of its standard "Table of Equipment" for tank units. In addition to use in training new tank gunners, the Army's new weapon simulator will see application by experienced personnel in skill maintenance programs.

DOD Awards Family Housing R&D Planning Contracts

The Defense Department has awarded three contracts for research and development studies aimed at building better and lower-cost military family housing units.

Receiving contracts were Carl Koch and Associates, Boston, Mass., $75,200; General Electric Co., Pittsburgh, Pa., $72,000; and the University of Michigan, Ann Arbor, Mich., $27,000.

The studies, approved by the Secretary of Defense, are the result of a joint recommendation of the Director, Defense Research and Engineering, and the Assistant Secretary of Defense (Installations and Logistics) for a DOD-sponsored project to determine what research and development can do to reduce the cost of military family housing.

If the exploration and planning program yields promising results, a second stage of the overall program would be the building and testing of prototype units. The last part of the program would be the establishment of long-range research and development programs to implement large-scale production.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1967 300-973/5